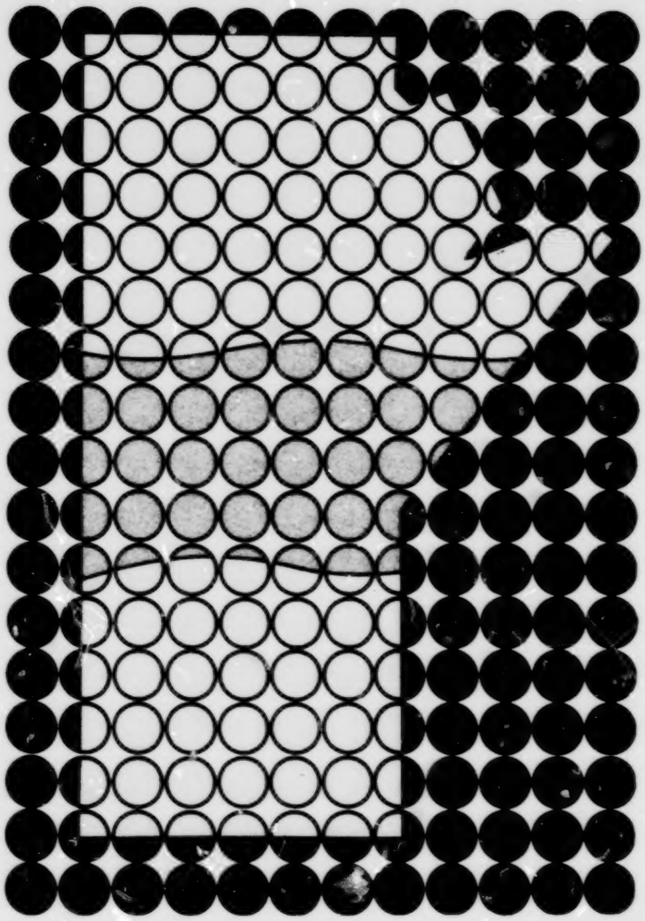

CANADA — MANITOBA
Soil Survey

Soils of the Rural Municipality of Lorne

Report D70

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Gouvernement du Manitoba

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Soils of the Rural Municipality of Lorne

by

M. N. Langman

CANADA-MANITOBA SOIL SURVEY

AGRICULTURE CANADA

MANITOBA DEPARTMENT OF AGRICULTURE

DEPARTMENT OF SOIL SCIENCE, UNIVERSITY OF MANITOBA

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Final typing of report manuscript was provided by D. Sandberg.

HOW TO USE THIS SOIL REPORT

This soils report contains considerable information about the soils, their origin and formation, their classification and their potential for various uses such as dryland agriculture, irrigation, engineering and recreation. The report is divided into four parts: Part I provides a general description of the area; Part 2 describes the methodology used in the study; Part 3 discusses the development, scientific classification and morphological characteristics of the soils in the study area, and Part 4 provides an interpretation of soil properties and associated landscape features as they affect soil capability or suitability for various uses.

The soil map of the study area is compiled on an uncontrolled air photo base which is included in a pocket of the report folder. The map shows the distribution of soil types and associated landscape features that are significant for potential use as field management units. It provides a linkage from landscapes within the study area to the information contained in the report.

To assist the user in retrieving soil information quickly, the following steps are suggested:

If project consists of many individual maps, proceed with STEP 1., if only single map in pocket, proceed with STEP 2 to 6.

STEP 1 Consult the index to map sheets _if_ the report contains many maps. Locate the areas of interest and note the map-sheet number(s) which identify the township and range on each map.

STEP 2 Consult the soil map in pocket of report folder. Locate the area(s) of interest on the map and identify the pertinent map unit symbols. Arabic numerals placed as superscripts following map symbols indicate the approximate proportion of each soil type within the map unit.

STEP 3 Consult the extended legend accompanying the soil map for an alphabetical listing of soil symbols giving the soil name, classification, drainage and related information concerning landforms, nature and depth of materials, and dominant vegetation.

STEP 4 For interpretive information about the soils, consult the appropriate Table in Part 4. Criteria utilized as guidelines in making these interpretations are provided in the Appendix.

STEP 5 Further information concerning the morphological properties and extent of the soils is presented in Part 3 where the soils are described alphabetically according to soil name.

STEP 6 Additional site-specific information not contained in this report is available on request from the Canada-Manitoba Soil Survey, Ellis Building, University of Manitoba.

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PART 1

GENERAL DESCRIPTION OF THE STUDY AREA

1.1 LOCATION AND EXTENT

This report contains information of a 1:50,000 scale resurvey of the Rural Municipality of Lorne in South-Central Manitoba. The area surveyed is comprised of Townships 5 and 6 in Ranges 8, 9, 10, 11 and 12 which covers an area of 92 160 ha (Figure 1).

Urban centers in the municipality include Altamont, Bruxelles, Cardinal, Mariapolis, Notre Dame de Lourdes, Somerset, St. Alphonse, St. Leon, St. Lupicin and Swan Lake.

1.2 LAND USE

Present landuse is dominantly agriculture with small areas of forest and urban settlement.

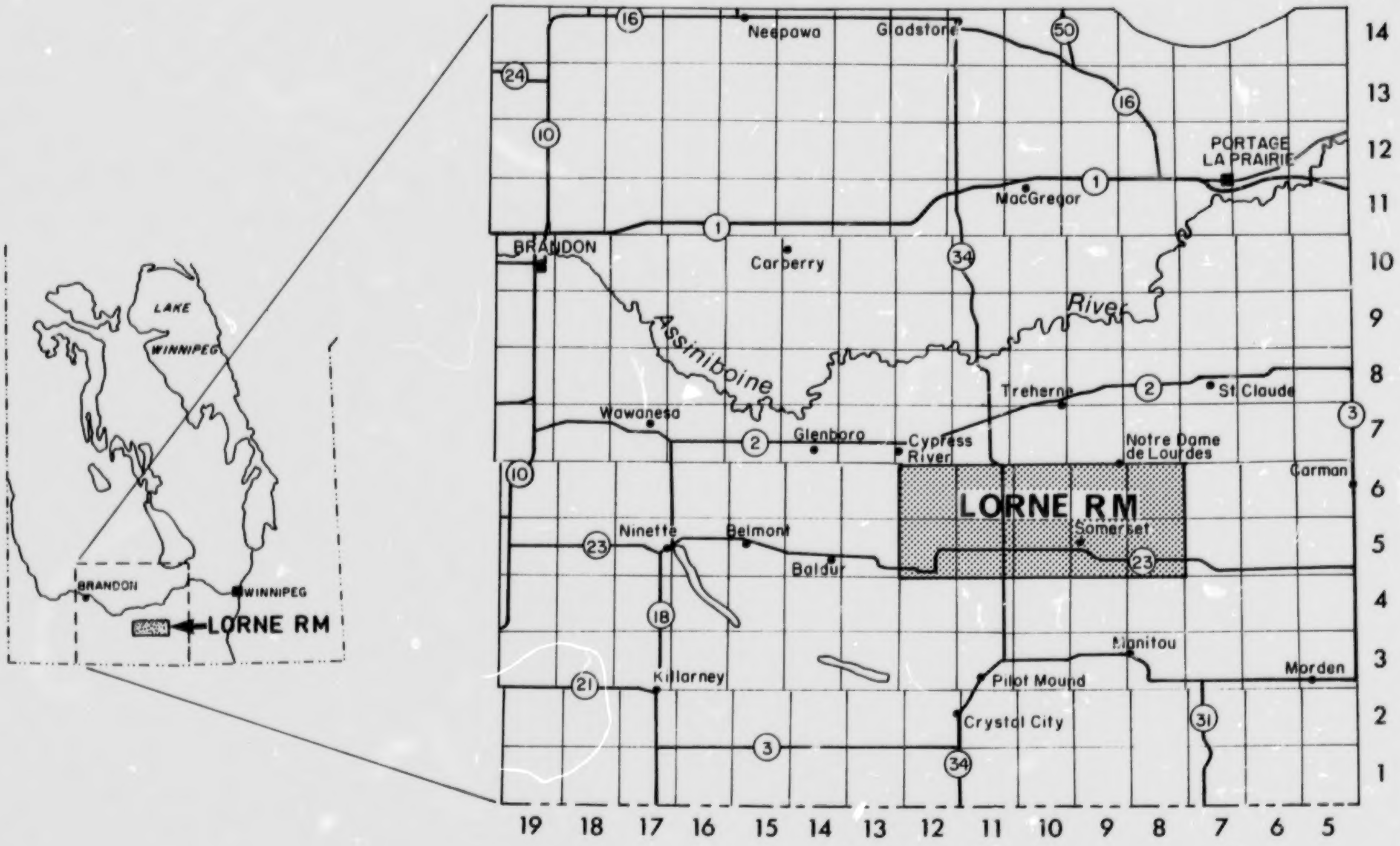
Clay loam till deposits, which dominate in the Municipality, are mostly used for cereal grains, oil seeds and forage crops on smooth to moderately sloping topography. Rougher topographic areas of these deposits are generally used for natural grazing and woodlots.

Shallow lacustrine deposits associated with smooth topography near Cypress River, Roseisle Creek and their tributaries, are mostly used for cereal grains, speciality crops and oil seed crops. Alluvial deposits associated with the Cypress River in the northwest of the study area generally support, cereal grains and forage crops.

Small deposits of gravel in morainic and fluvial outwash materials are generally excavated for road building and the aggregate industry.

1.3 PHYSIOGRAPHY

The Rural Municipality of Lorne is located on the Second Prairie Steppe in a rolling to hummocky, dominantly morainic landscape locally called the Tiger Hills (Elson, 1970). Lorne occurs almost exclusively in the Pembina Hills subsection and section of the Saskatchewan Plain Division in the Interior Plains Region as depicted on the Physiographic Map of Manitoba (Figure 2). The extreme northeast of Lorne occurs in the Pembina Escarpment subsection of the Pembina Hills section, and the extreme northwest occurs within the Tiger Hills Upland section.


LAKE
WINNIPEG
BRANDON
WINNIPEG
LORNE RM
Neepawa
Gladstone
PORTAGE LA PRAIRIE
MacGregor
BRANDON
Carberry
Assiniboine
River
Wawanesa
Glenboro
Cypress River
Treherne
St Claude
Notre Dame de Lourdes
Carman
LORNE RM
Somerset
Ninette
Belmont
Baldur
Manitou
Morden
Killarney
Pilot Mound
Crystal City
14
13
12
11
10
9
8
7
6
5
4
3
2
1
19
18
17
16
15
14
13
12
11
10
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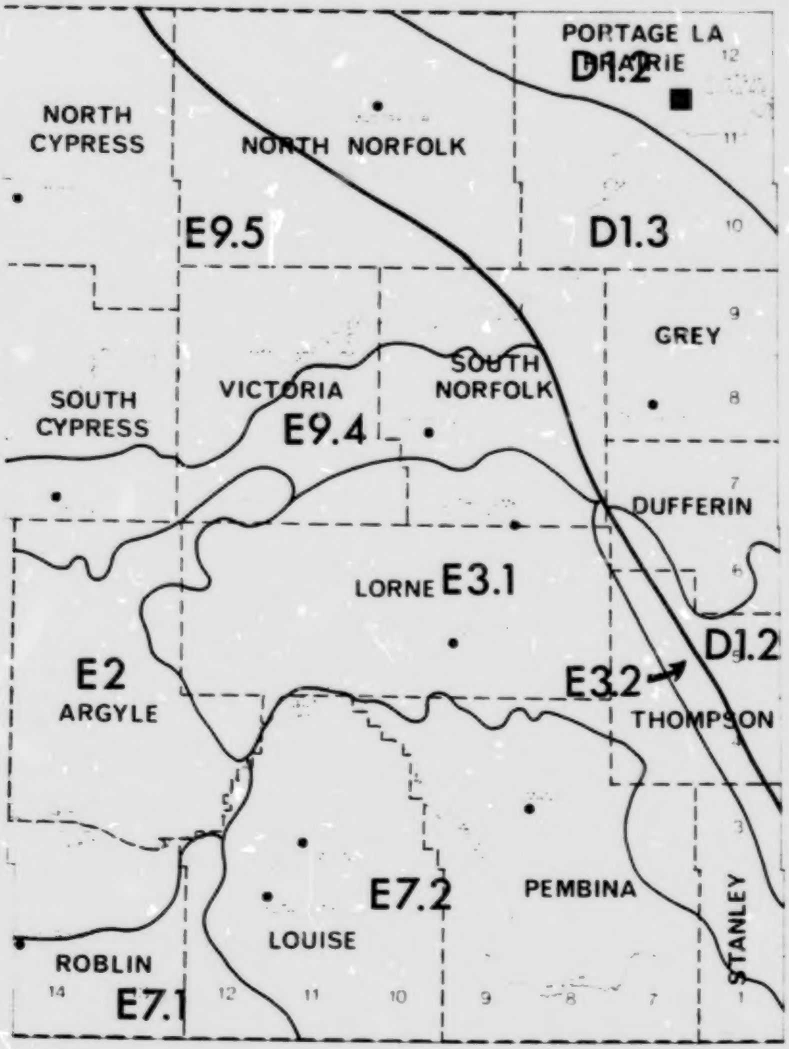
8
7
6
5

Figure 1: Location map of the Rural Municipality of Lorne.


PORTAGE LA PRAIRIE
D1.2
NORTH CYPRESS
NORTH NORFOLK
E9.5
D1.3
GREY
SOUTH CYPRESS
VICTORIA
SOUTH NORFOLK
E9.4
DUFFERIN
LORNE
E3.1
E2
ARGYLE
D1.2
E3.2
THOMPSON
E7.2
PEMBINA
LOUISE
STANLEY
ROBLIN
E7.1
14
12
11
10
9
8
7
1
2
3
4
5
6
7
8
9
10
11
12

Division	Section	Subsection
D. Manitoba Plain	D1. Red River Plain	.2 Red River Valley .3 Lower Assiniboine Delta
E. Saskatchewan Plain	E1. Turtle Mountain Upland	.2 Mountainside Escarpment
	E2. Tiger Hills Upland	
	E3. Pembina Hills Upland	.1 Pembina Hills .2 Pembina Escarpment
	E7. Pembina River Plain	.1 Boissevain Plain .2 Manitou Plain
	E9. Assiniboine River Plain	.4 Brandon Lakes Plain .5 Upper Assiniboine Delta

Figure 2: Physiographic Map of the Rural Municipality of Lorne.

1.4 BEDROCK GEOLOGY

Dark grey to grey-green hard, brittle and soft Cretaceous shale from the Odanah member of the Riding Mountain Formation underlies the study area. (Water Resources Branch, 1976). Red to purple staining occurs along joints and bedding planes of the hard layers. The top of this member, which is estimated to be 180 m thick, has been eroded into fissile fragments and an irregular surface form (Elson, 1970). Shale outcrops in the study area form cliffs and are the core of numerous drumlinoid and other ridges. Odanah shale is the principal component of most esker and fluvial gravels in the area.

1.5 SURFACE DEPOSITS

The total thickness of unconsolidated deposits overlying bedrock is generally less than 30 m throughout the map area. Two exceptions to this trend occur in and around the Somerset and Notre Dame townsites, where drift thickness ranges from 30 to 60 m. Bedrock is exposed at the surface in some drainage channels and occasionally on crests of steep ridges and hummocks in the map area.

The surficial deposits of the Rural Municipality of Lorne are of two major types: 1) those deposited by glacial ice as till, and 2) those deposited in meltwater streams or lakes (Figure 3). A third group comprised of recent alluvium, colluvium or organic deposits occur in limited areas.

Till deposits are the most extensive surface deposit in Lorne. Moderately to strongly calcareous, slightly stony, mixed till of limestone, granite and shale origin occurs in morainic hills throughout the map area east and south of Bruxelles. Strongly to extremely calcareous, stony till of dominantly limestone origin occurs west of Bruxelles. Non-calcareous, slightly stony till derived from shale bedrock occurs mostly on steep ridges in the map area.

Silty and clayey lacustrine deposits occur on gently sloping landscapes adjacent to the Cypress River and Roseisle Creek. Silty lacustrine deposits are found in small pockets on morainic ridges mostly north-west of the Cypress River. Thin lacustrine veneers over till or gravel occur mainly on gently sloping topography between the western border of Lorne and Altamont townsite in the south of the map area.

Fluvial sands and gravels are found in the vicinity of the Indian Springs Indian Reserve and in isolated pockets throughout steep morainic landscapes.

1.6 RELIEF

Relief ranges from lows of 330 m.a.s.l. in the extreme north-east and 360 m.a.s.l. in the extreme north-west of the map area, to a high of 525 m.a.s.l. east of Bruxelles. Average elevations range from 450 to 480 m.a.s.l. (Figure 4).

Hummocky topography dominates throughout much of ranges 11 and 12. Moderate (5 to 9 percent) to steep slopes (15 to 30 percent) are common in this area. Gently sloping (3 to 5 percent), rolling topography dissected by moderate to strongly sloping ridges occurs in ranges 9 and 10. The gentle to moderate sloping topography of range 8 has been somewhat dissected by Roseisle Creek and its tributaries.

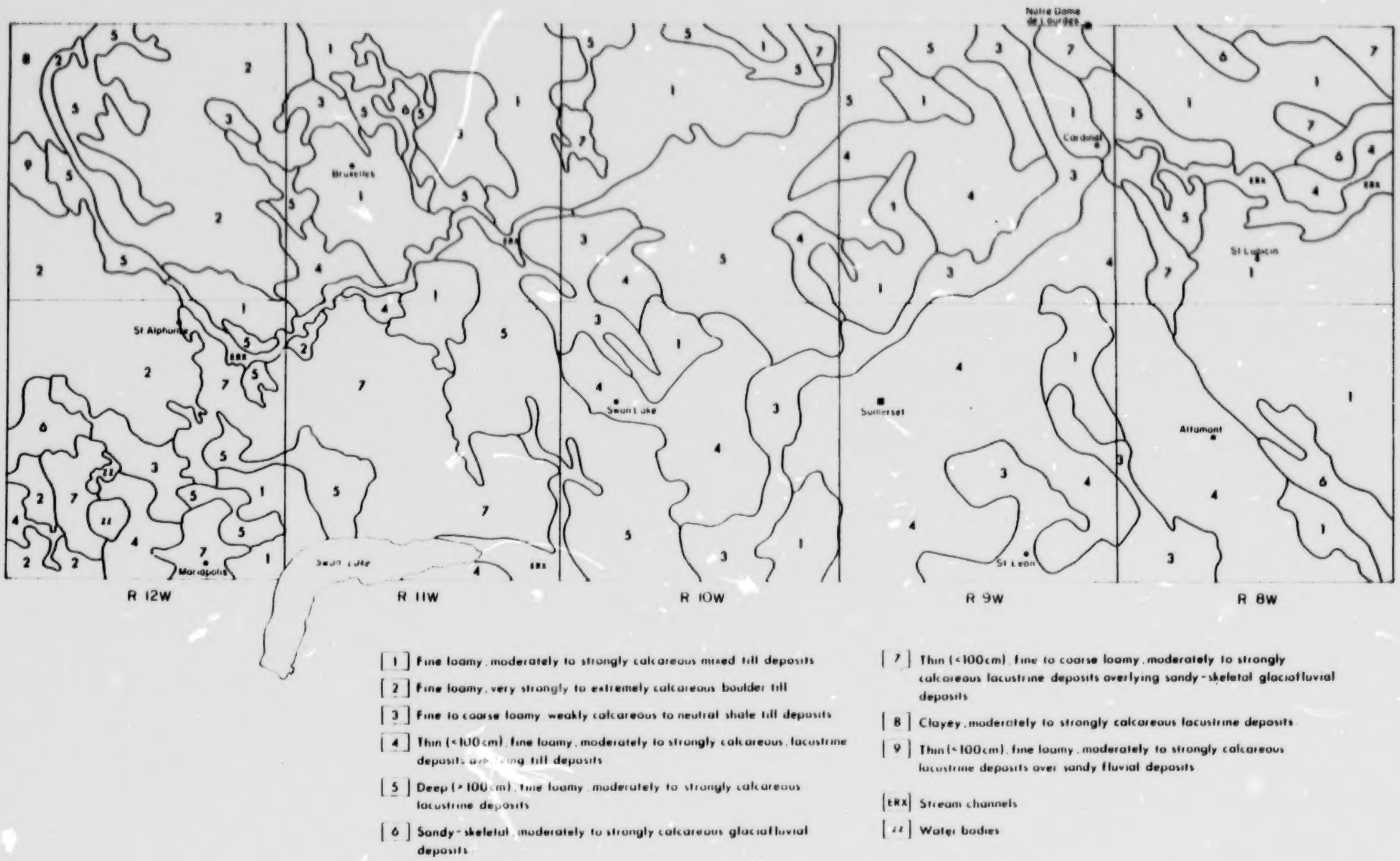

Notre Dame de Lourdes
Cardinal
Bruxelles
St Alphonse
St Lupicin
Swan Lake
Somerset
Altamont
Mariapolis
St Leon
ERX
Tp 6
Tp 5
R 12W
R 11W
R 10W
R 9W
R 8W
1 Fine loamy, moderately to strongly calcareous mixed till deposits
2 Fine loamy, very strongly to extremely calcareous boulder till
3 Fine to coarse loamy weakly calcareous to neutral shale till deposits
4 Thin (<100cm), fine loamy, moderately to strongly calcareous, lacustrine deposits overlying till deposits
5 Deep (>100cm), fine loamy, moderately to strongly calcareous lacustrine deposits
6 Sandy-skeletal, moderately to strongly calcareous glaciofluvial deposits
7 Thin (<100cm), fine to coarse loamy, moderately to strongly calcareous lacustrine deposits overlying sandy-skeletal glaciofluvial deposits
8 Clayey, moderately to strongly calcareous lacustrine deposits
9 Thin (<100cm), fine loamy, moderately to strongly calcareous lacustrine deposits over sandy fluvial deposits
ERX Stream channels
ZZ Water bodies

Figure 3: Surficial Deposits Map of the Rural Municipality of Lorne.

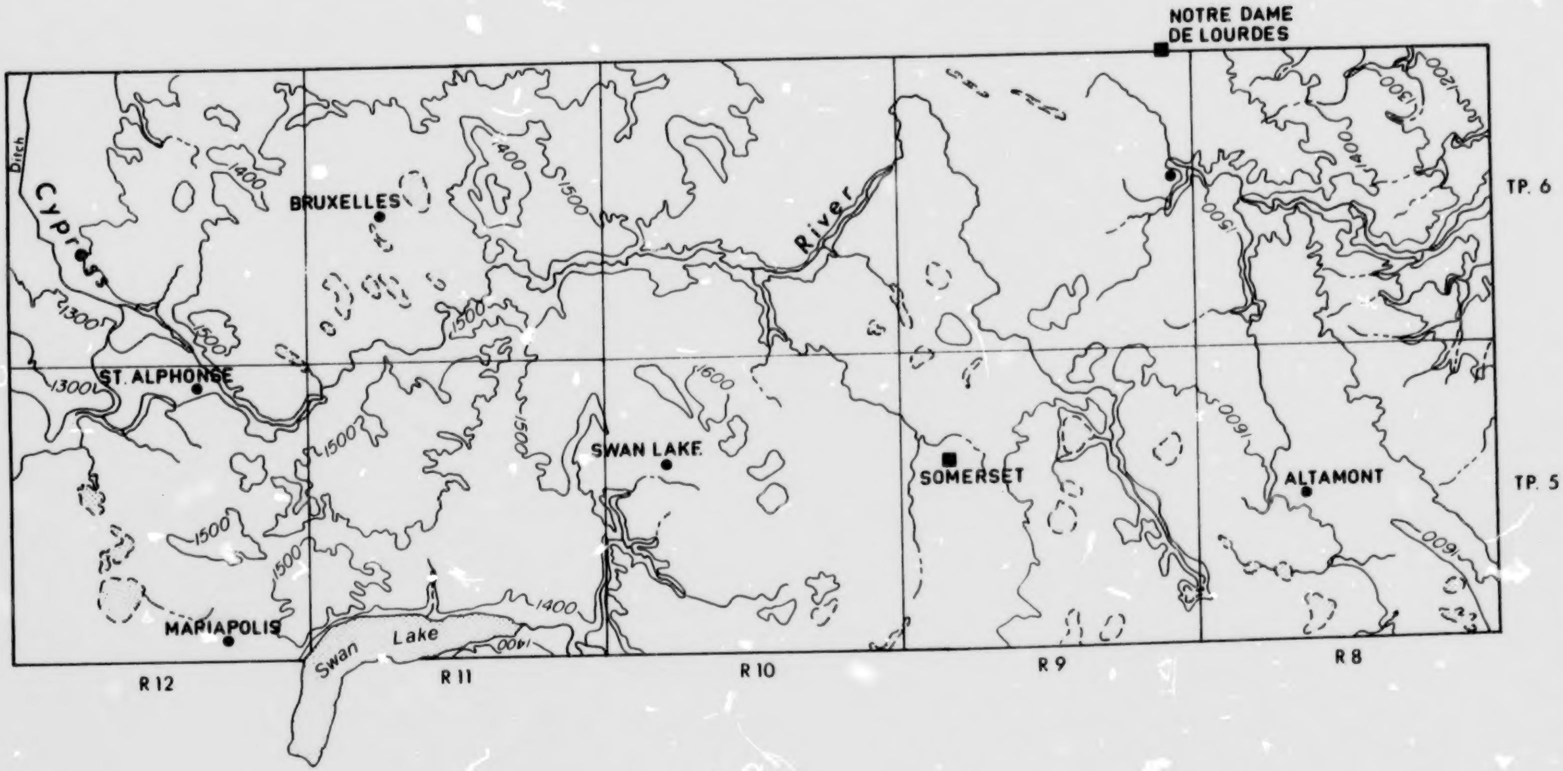

NOTRE DAME
DE LOURDES
TP. 6
TP. 5
Ditch
Cypress
River
BRUXELLES
ST. ALPHONSE
MARIAPOLIS
SWAN LAKE
Swan Lake
SOMERSET
ALTAMONT
1200
1300
1400
1500
1600
R 12
R 11
R 10
R 9
R 8

Figure 4: Relief and Drainage Map of the Rural Municipality of Lorne.

1.7 SURFACE AND SUBSURFACE HYDROLOGY

Natural surface drainage is in three directions in the Rural Municipality of Lorne: 1) the Cypress River and its tributaries drain northwest into the Assiniboine River, 2) Roseisle Creek and its tributaries drain the eastern section of the map area to the east, and 3) a few intermittent creeks drain to the south into the Pembina trench and Swan Lake (Figure 4).

Numerous shallow enclosed sloughs and small lakes occur throughout the map area, many of which dry up in the summer. Water quality in sloughs is usually unpotable and is frequently saline. The hummocky knolls associated with these sloughs are often subject to droughtly conditions by mid-summer.

Groundwater table depths range from relatively shallow (3 meters) to deep (120 meters) in the study area. Groundwater quality ranges from good to very poor for human consumption but is generally fair (Water Resources Branch, 1976).

1.8 CLIMATE

Somerset townsite has the only weather station in the study area and is presented here as an example of typical climatic conditions. Local weather conditions are extremely variable and in an area the size of Lorne can vary substantially from the climatic conditions recorded in Somerset.

The average annual precipitation at Somerset is 546.8 mm, approximately 63% (349.4 mm) of which falls as rain during the growing season, May 1 to Sept. 30 (Table 1). The average date of the last spring frost 0°C is May 19 and the first fall frost occurs on Sept 22 giving a frost-free period of 125 days. For hardy crops which can withstand temperatures down to -2.2°C, the frost free period averages 140 days. There are approximately 1667 growing degree-days above 5°C at Somerset and from 2300 to 2400 Corn Heat Units.

The soil climate of Lorne occurs within the limits of the Cool Boreal soil temperature class and the subhumid soil moisture regime (Clayton and Marshal, 1972). This class has a mean annual soil temperature at 50 cm depth ranging from 2 to 8°C. The subhumid moisture regime has a significant moisture deficit of 75 to 125 mm during the growing season.

1.9 VEGETATION

The R.M. of Lorne occurs within the Aspen-Oak section of the Boreal Forest Region (Rowe, 1972). Before settlement this area was mostly wooded. However, soil profile development in the south and west of the map area suggests that soils developed first under grassland, but later were invaded by trees from the wooded escarpment that lies to the east (Ellis and Shafer, 1943). Tall prairie grasses and associated herbs are still in evidence on droughtier, south and west facing slopes.

Since settlement much of the native Aspen-Oak vegetation in the area has been cleared for cultivation. Some Aspen groves (Populus tremuloides) can still be found, in favourable sites. Occasional clumps of oak (Quercus macrocarpa) are also found mostly on drier sites such as the low mounds and eroded slopes of ravines where shale bedrock comes close to the surface (Ellis and Shafer, 1943).

TABLE 1

Climatic Data for the R.M. of Lorne

Somerset Weather Station[1]

Mean Annual Rainfall (mm)	400.1
Mean Annual Snowfall (cm)	134.9
Mean Total Precipitation (mm)	546.8
Average Precipitation, May 1 - Sept. 30 (mm)	349.4
Mean Daily Temperature (oC)	1.8
Average Date Last Spring Frost (0oC)	May 19
Average Date First Fall Frost (0oC)	Sept. 22
Frost Free Period (0oC)	125
Growing Degree Days (above 5oC)	1667

Estimated Climatic Averages for the R.M. of Lorne[2]

Average Date of Last Spring Frost (-2.2oC)	May 15
Average Date of First Fall Frost (-2.2oC)	Sept. 25
Corn Heat Units	2300

1. Canadian Climatic Normals 1951-1980. Vol. 2, Temperature, Vol. 3, Precipitation, Vol. 4, Degree Days, Vol. 6, Frost. Atmospheric Environment Service, 1982.

2. Dunlop, S. and C.F. Shaykewich. 1982. Southern Manitoba's Climate and Agriculture. Manitoba Agriculture.

PART 2

METHODOLOGY

2.1 MAPPING

Semi-detailed (1:50,000 scale) soil mapping was conducted by examining soil profiles to at least one meter depth along road allowances and trails resulting in each soil inspection representing approximately 30 hectares. Occasional soil inspection traverses were made where soil complexity necessitated additional field observations.

Detailed (1:20,000 scale) soil mapping was conducted at Altamont, St. Leon, Somerset, Swan Lake and Mariapolis townsites and on one 12- and one 18- section area typifying soil landscape relationships in Lorne. Detailed mapping was performed by examining soil profiles to at least one meter depth at approximately 150 meter intervals along traverses through sections resulting in each soil inspection representing approximately 10 hectares.

Boundaries delineating map units in the survey area were compiled on aerial photographs for the 1:20,000 scale mapping and on a National Topographic Service base map for the 1:50,000 scale mapping.

2.2 UNITS OF MAPPING

The level of taxonomic classification used in the map area is the soil series. A series is defined as a naturally occurring soil body such that any profile within the body has a similar number and arrangement of horizons, whose physical and chemical properties are within a narrowly defined range. If significant acreages of soils with properties varying slightly from the prescribed ranges occur, a soil series variant is established. A soil series variant is named after the soil it most closely resembles, as well as the feature which distinguishes it from the named soil (eg. Pembina 1, is a soil profile displaying the characteristics defined by the Pembina series but in addition having a VFSL-SiL textured glaciolacustrine substrate within a meter of the soil surface).

The delineation of map units, whether described by one, two or three soil series is not exact. Map units vary with local topography, drainage, erosion and soil profile properties. The decision to outline and label any given area is based on observed soil and landscape features and air-photo interpretation. The delineation of soil boundaries serves to separate soils having properties and conditions which are significant for potential use as field management units. Some soil changes are more obviously marked in nature and can be delineated accurately, others are gradual and boundary lines are not sharp nor well defined.

There are two kinds of map units used in the resurvey of soils in Manitoba. They are simple and compound map units.

Simple map units usually contain one dominant soil series, the properties of which vary within narrow limits. The map unit can also contain a small proportion, usually less than 15 percent, of related but unlike soils and phases. The proportion of such undescribed inclusions tends to increase as soil inspection density decreases or where soil variability has no obvious predictable occurrence. Simple map units are normally named after the dominant soil series.

Compound map units usually contain significant proportions of two or more unlike soil series. These soils are related geographically but cannot be delineated separately because of the intricacy of soil pattern, the cartographic limitations of map scale and survey effort. In many compound map units differences in soils and their related characteristics are strongly contrasting. Dominant, subdominant and minor (if strongly contrasting) soil series are identified, and their percentile proportions within each map delineation is specified. A user must refer to two or more named soil series in the soil legend and soil report to obtain a complete description of a compound map unit.

A variation of the compound map unit, the complex map unit, contains two or more named or unnamed soils and non-soils which occur in unspecified proportions. This map unit occurs where soil variability is so complex and unpredictable that soils cannot be delineated separately, nor can their relative proportions be estimated. A user will need only to refer to one map unit name in the soil legend and soil report to obtain as complete a description as is possible of the soil complex. Very often, it is desirable to indicate by map unit symbol, minor variations in certain intrinsic properties of soils or landscape features that deviate from the normal. These variants or phases of series usually affect soil management. In the study, the effect of four such properties and features are indicated. These are erosion, slope class, degree of stoniness and salinity. The degree or magnitude of each is designated in the following manner:

Erosion

x - non eroded or minimal
1 - weakly eroded
2 - moderately eroded
3 - severely eroded
O - overblown

Slope Class

x - 0 to 2% level to nearly level
c - 2 to 5% very gently sloping
d - 5 to 9% gently sloping
e - 9 to 15% moderately sloping
f - 15 to 30% strongly sloping
g - 30 to 45% very strongly sloping
h - 45 to 70% extremely sloping

Stoniness

x - non stony
1 - slightly stony
2 - moderately stony
3 - very stony
4 - exceedingly stony
5 - excessively stony

Salinity

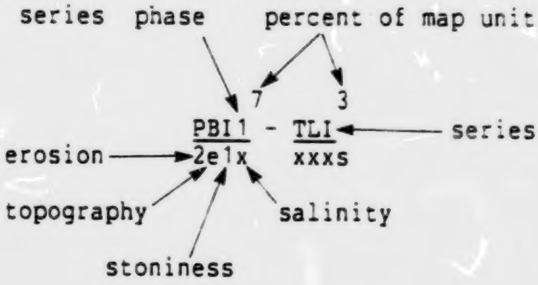
x - non saline (0-4 mS/cm)
s - slightly saline (4-8 mS/cm)
t - moderately saline (8-15 mS/cm)
u - strongly saline (>15 mS/cm)

The convention employed to indicate these features in the map symbol is as follows:

If none of the above properties are observed to be significant, the map symbol representing the normal or unaffected soil series is used alone without modifiers.

If one or more phase features are recognized, the appropriate letter or number is placed below the soil series symbol in one of four designated locations in the map unit symbol. The designated order is erosion, slope class, stoniness and salinity. If a particular feature is not observed to be significant, an x is used in its appropriate designated location in the map symbol.

For example, the compound map unit coded:



Means that an estimated 70 percent of this compound map unit contains Pembina soils with a silty substrate (PBI) on moderately eroded (2), 9 to 15 percent slopes (e) which are slightly stony (1); and approximately 30 percent of the map unit is slightly saline(s) Tellier soils on level, non-eroded, non-stony land.

Detailed definitions for erosion, topography, stoniness and salinity phase classes are given in the Glossary (Appendix A).

2.3 SAMPLING

During the course of field investigations and mapping, soil samples were collected at selected locations for soil characterization. Soils suspected of being sufficiently saline to inhibit agricultural potential were sampled at 10 to 25 cm and at 50 to 60 cm. These samples were analyzed for electrical conductance and soluble salt content. Twenty-two profiles representing typical soils found in the map area were sampled and analyzed in detail for soil characterization (Appendix F). Surface soil samples were collected to assess erosion causing soil characteristics where water or wind erosion was an active or potential hazard.

PART 3

DEVELOPMENT, CLASSIFICATION AND MORPHOLOGY OF SOILS

3.1 SOIL CLASSIFICATION AND DEVELOPMENT

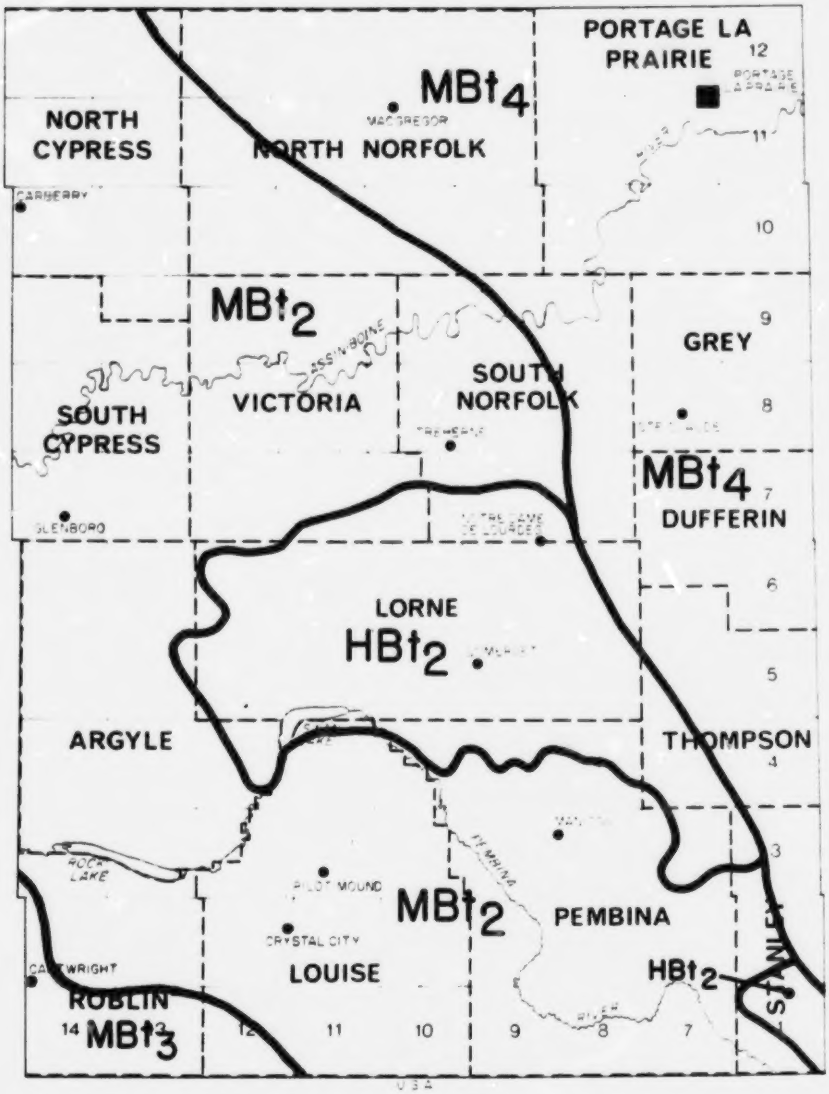
The principal factors affecting soil formation are climate, vegetation, parent material, relief and drainage. The interaction of these soil forming factors is expressed in the morphological characteristics of soil. Through observation of these characteristics, it is possible to classify soils into natural units and to infer their genesis or the processes involved in their formation.

The Rural Municipality of Lorne is located dominantly in the Cryboreal, moderately cold to Boreal cool, subhumid and subaquic soil climate zone of the High Boreal-temperate Ecoregion (Figure 5). The extreme north-east portion of Lorne occurs within the Boreal, moderately cool, subhumid soil climate zones of the Mid Boreal-temperate Ecoregion. The combination of soil and aerial climate conditions within these ecoregions promotes the growth of aspen-oak groves, tall-prairie grasses and associated herbs.

The slightly cooler and more moist conditions in the High Boreal-temperate ecoregion favours the zonal development of Chernozemic Dark Gray and Dark Gray Luvisol soils on better drained sites and Humic or Humic Luvic Gleysol soils on poorly drained sites. Within this region, local variation of soil forming factors can further modify the regional development patterns. For instance, in the hummocky areas of Lorne slightly cooler and more moist north-facing slopes have resulted in the development of Luvisolic soils. Chernozemic soils have developed on relatively drier and warmer south-facing slopes vegetated by tall-prairie grasses.

The relatively warmer and drier conditions of the Mid-Boreal-temperate ecoregion have resulted in the zonal development of Chernozemic Blacks on better drained positions and Humic Gleysols on poorly drained soils. A minor amount of the fine loamy till deposits dominant throughout the study area are severely eroded and the resulting soils are generally Regosols or regosolic subgroups.

Soil development is minimal in recent alluvial deposits near streams where soils are mostly Cumulic Regosols.


PORTAGE LA PRAIRIE
12
PORTAGE LA PRAIRIE
MBt4
MACGREGOR
NORTH CYPRESS
NORTH NORFOLK
CARBERRY
11
10
MBt2
ASSINIBOINE
GREY
9
SOUTH CYPRESS
VICTORIA
SOUTH NORFOLK
8
TREHERNE
MBt4
7
DUFFERIN
GLENBORO
NOTRE DAME DE LOURDES
6
LORNE
HBt2
5
ARGYLE
THOMPSON
4
ROCK LAKE
3
PILOT MOUND
MBt2
PEMBINA
CRYSTAL CITY
CARTWRIGHT
LOUISE
HBt2
STANLEY
ROBLIN
14
MBt3
13
12
11
10
9
8
7
U.S.A.

Ecological Region	Sub-Region Symbol	Soil Class		Dominant Soil Order	Vegetation Zone
		Temperature Class	Moisture Subclass		
High Boreal - temperate	HBt_2	Cryboreal, cold to moderately cold	Subhumid to humid	Chernozemic (dark grey), Brunisols, Luvisols, Organics	Grassland - Forest Transition
Mid Boreal - temperate	MBt_2	Boreal, cool	Subhumid	Chernozemic (black), Gleysols	Grassland and Aspen Parkland
	MBt_3	Boreal, moderately cool to cool	Subhumid	Chernozemic (black), Gleysols	Grassland and Aspen Parkland
	MBt_4	Boreal, cool	Subhumid	Chernozemic (black), Gleysols	Grassland and Aspen Parkland

Figure 5: Ecological Regions and Subregions of the Rural Municipality of Lorne.

3.2 SOIL EROSION

The soils of the R.M. of Lorne have numerous local minor limitations including stoniness, salinity, rugged landscape, droughtiness due to low moisture holding capacity, wetness and shallow profiles due to high lime content of parent materials. However, soil water erosion is wide spread and causes significant limitations to land use. Soil erosion by water is considered important because it is commonly held that soil erosion reduces production potential, depletes nutrients and degrades tilth (Presant, 1984). This process can be greatly accelerated by man's activities which increase surface runoff or reduce natural protection afforded by vegetative cover.

The U.S.D.A. (1965) has developed an Universal Soil Loss Equation (U.S.L.E.) which estimates the water erosion potential based on soil, landscape, vegetation, climate and conservation. This equation was used to estimate the erosion potential of the major soils in the R.M. of Lorne occurring in typical landscape conditions.

The soil loss equation is:

$$A= RKLSCP$$

where,

A - is the estimated soil loss per unit area. The units used in this study are tonnes/ha.

R - is the rainfall factor which is the number of erosion-index units in a normal year's rain. The erosion index is a measure of the erosive force. An R-factor was calculated for the R.M. of Lorne using Brandon weather data and a modified equation by McCool et. al. (1982) which incorporates a snow-melt factor into the R-factor. The calculated R is 951 (SI units).

LS - are the slope length and slope gradient factors which are ratios of soil loss from a given site to soil loss from a standard plot.

C - is the crop management factor. It is assumed in this analysis that all soil loss is from fallow fields where C=1.

P - is the erosion-control practice factor. It is assumed that no conservation or erosion control occurs in the R.M. of Lorne for the purposes of this study. Therefore, P-1.

Table 2 presents estimates of soil erosion potential for well drained soils commonly occurring in the R.M. of Lorne under typical slope length and slope steepness conditions. It is apparent that as slope length and steepness increases the soil erosion potentials are greatly increased.

An annual soil loss tolerance level of 11.2 tonnes/ha has been commonly accepted throughout agricultural areas of Canada and the United States. If potential soil losses in excess of 11.2 tonnes/ha are unacceptable, all common well drained soils in the R.M. of Lorne under fallow conditions would exceed tolerable soil loss potentials when occurring on d-slopes or steeper and on slope lengths of 30 m or longer. Many soils (eg. Pembina, Hilton, Tiger Hills and Nayler series) in the R.M. of Lorne commonly occur on landscapes exceeding these slope length/steepness situations.

Conservation practices should be followed on all soils in the R.M. of Lorne but especially in hummocky morainic landscapes and steep/long slope situations. Drainage ways should be grassed, contour cultivation should be practiced and summer fallow should be eliminated wherever feasible. Conservation techniques should be followed when cultivating soils on landscapes of 3% slope, (c-slope class) or greater. Soils occurring on 9% slope, (e-slope class) or greater should be left uncultivated to reduce the erosion potential.

3.3 SOIL SERIES DESCRIPTIONS

The parent material upon which a soil develops and the type of soil development are the dominant diagnostic features used in classifying and mapping soils. Table 3 provides a convenient, abbreviated reference key illustrating the relationship among soil series, soil moisture class, soil taxonomy and parent material. A more comprehensive grouping of soils and parent materials is presented in Table 4

Soil series, soil variants and complex map unit descriptions of the Rural Municipality of Lorne are listed in alphabetical order. The descriptions include pedon features such as soil taxonomy, soil texture, natural drainage, acidity or calcareousness, parent materials and other distinctive morphological features. Site descriptions include topographic setting, surface runoff, permeability, stoniness, salinity, erosion and natural vegetation. Additional information includes a listing of those soils which are morphologically similar to the soil being described, along with a brief description of the features which distinguish these similar soils from the named soil.

Physical and chemical data for 22 selected soil profiles is included in Appendix F. Each profile has a range of soil characteristics within the limits diagnostic of the series after which it is named. Information pertaining to the suitability and management of each soil for agriculture, engineering uses and urban or recreational applications is presented in Part 4 of this report.

TABLE 3

Key to the Soil Series of the Rural Municipality of Lorne According to Drainage, Subgroup and Parent Material

Soil Moisture Class	Taxonomic Classification (Subgroup)	Till			Lacustrine over Till	Glaciofluvial			
		Loamy Mixed	Loamy Shale	Loamy Extremely Calcareous	Clayey/Loamy	Sandy-skeletal	Loamy/Sandy-skeletal	Clayey/Loamy to Sandy	Fine loamy/sandy
Well to moderately well	Orthic Black	Darlingford (DGF)	Manitou (MXS)	Hilton (HIT)	Knudson (KUD)		Croyon (CYN)		
	Orthic Dark Gray	Dezwood (DZW)	Fifere (FFR)	Tiger Hills (TGL)	Altamont (ATN)	Leary (LRY)	Vandal (VDL)		
	Orthic Gray Luvisol	Poyser (PYR)							
	Orthic Dark Gray Luvisol	Pembina (PBI)	Nayler (NYO)		Kingsley (KIS)		Trinton (TNT)		
Imperfectly	Gleyed Rego Black	Ferris (FRS)		Barwood (BWO)	Joyale (JYL)		Capell (CXT)		Crookdale (CKD)
	Gleyed Dark Gray	Zaplin (ZPI)	Fresno (FSO)		Tellier (TLI)		Vartel (VTL)		
	Gleyed Black	Nikkel (NKK)			Ullrich (ULH)		Druxman (DXM)		
	Gleyed Black Solonetz							Oliver (OIV)	
	Gleyed Cumulic Regosol								
Poorly to very poorly	Rego Humic Gleysol^A	Cazlake (CZK)^A		Hickson (HKS)	Guerra (GRR)^A		Carvey (CAY)		
	Rego Humic Gleysol^B	Horose (HOS)^B			Narish (NSH)^B				
	Terric Mesisol								
	Typic Mesisol								

A - Gleysols associated with Black Chernozems

B - Gleysols associated with Dark Gray Chernozems

This legend does not include soil series variants, soil complexes and non-soil features

my/sandy	Fine loamy	Coarse loamy to fine loamy	Organic/Sandy to Fine loamy	Organic
	Ramada (RAM)			
	Firdale (FIR)			
e (CKD)	Prodan (PDA) Danlin (DLN) Charmin (CXV)	Levine (LEI)		
	Tadpole (TDP)		Perillo (PER)	Xavier (XVI

TABLE 2

Potential Annual Soil Loss (tonnes/hectare) of Major Soils in the R.M. of Lorne for Common Slope Length Sand Slope Gradients and with no Vegetative Cover

Soil Name (Map Symbol)	K-Value (SI Units)	Slope Length 30 m					Slope Length 90 m				
		Level (0.5%)	c-slope (3%)	d-slope (8%)	e-slope (12%)	f-slope (20%)	Level (0.5%)	c-slope (3%)	d-slope (8%)	e-slope (12%)	f-slope (20%)
Dezwood (DZW)	.037	3.5	10.6	35.2	63.3	140.7	5.3	14.1	59.8	114.4	246.3
Pembina (PBI)	.037	3.5	10.6	35.2	63.3	140.7	5.3	14.1	59.8	114.4	246.3
Nayler (NYO)	.041	3.9	11.7	38.9	70.2	155.9	5.8	15.6	66.3	126.7	272.9
Altamont (ATN)	.039	3.7	11.1	37.0	66.8	148.4	5.6	14.8	63.1	120.5	259.6
Hilton (HIT)	.028	2.7	7.9	26.6	47.9	106.5	3.9	10.7	45.3	86.5	186.4
Leary (LRY)	.012	1.1	3.4	11.4	20.5	45.6	1.7	4.6	19.4	37.1	79.9
Vandal (VDL)	.026	2.5	7.4	24.7	44.5	98.9	3.7	9.9	42.0	80.4	173.1
Firdale (FIR)	.039	3.7	11.1	37.1	66.8	148.4	5.6	14.8	63.1	120.5	259.6
Fifere (FFR)	.028	2.7	7.9	26.6	47.9	106.5	3.9	10.7	45.3	86.5	186.4

Assuming R=951, C=1, P=1

K calculated from modal soil profile samples

TABLE 4

General Soils Legend-Key to the Soils of the Rural Municipality of Lorne Based on Extent (hectares, % of Map), Parent Material, Soil Moisture Class, Subgroup and Series

	Map Symbol	Area (ha)	%of Map Area
1. Soils developed on deep (>100 cm), fine loamy and coarse loamy (L, CL, SICL), moderately to strongly calcareous mixed till deposits			
a) Well to moderately well drained			
• Darlingford Series (Orthic Black)	DGF	126.7	0.13
• Dezwood Series (Orthic Dark Gray)	DZW	11 395.7	11.62
• Poyser Series (Orthic Gray Luvisol)	PYR	614.0	0.63
• Poyser Series, coarse-loamy substrate variant (Orthic Gray Luvisol)	PYR1	394.6	0.40
• Poyser Series, sandy-skeletal substrate variant (Orthic Gray Luvisol)	PYR2	891.5	0.91
• Pembina Series (Orthic Dark Gray Luvisol)	PBI	4 162.2	4.24
• Pembina Series, coarse-loamy substrate variant (Orthic Dark Gray Luvisol)	PBI1	989.4	1.01
• Pembina Series, sandy-skeletal substrate variant (Orthic Dark Gray Luvisol)	PBI2	194.2	0.20
b) Imperfectly drained			
• Ferris Series (Gleyed Rego Black)	FRS	1 385.2	1.41

• Zaplin Series (Gleyed Dark Gray)	ZPI	1 081.7	1.10
• Nikkel Series (Gleyed Black)	NKK	355.5	0.36
c) Poorly drained			
• Cazlake SeriesA (Rego Humic Gleysol)	CZK	538.8	0.55
• Horose SeriesB (Rego Humic Gleysol)	HOS	639.5	0.65
2. Soils developed on deep (>100 cm), fine loamy and fine silty (CL, L, SiL), weakly calcareous to neutral, shale till deposits.			
a) Well to moderately well drained			
• Manitou Series (Orthic Black)	MXS	983.1	1.00
• Fifere Series (Orthic Dark Gray)	FFR	3 848.5	3.92
• Nayler Series (Orthic Dark Gray Luvisol)	NYO	3.499.7	3.57
b) Imperfectly drained			
• Fresno Series (Gleyed Dark Gray)	FSO	290.0	0.30
3. Soils developed on fine loamy (L, CL, SICL) moderately to strongly calcareous lacustrine deposits overlying moderately to strongly calcareous fine loamy (L, CL) mixed till at 25 to 100 cm depth.			
a) Well to moderately well drained			
• Knudson Series (Orthic Black)	KUD	6 200.1	6.32
• Altamont Series (Orthic Dark Gray)	ATN	6 301.6	6.43
• Kingsley Series (Orthic Dark Gray Luvisol)	KIS	402.9	0.41
b) Imperfectly drained			
• Joyale Series (Gleyed Rego Black)	JYL	4 901.1	5.00

• Tellier Series (Gleyed Dark Gray)	TLI	1 749.5	1.78
• Ullrich Series (Gleyed Black)	ULH	670.5	0.68
c) Poorly drained			
• Guerra Series[A] (Rego Humic Gleysol)	GRR	1 331.0	1.36
• Narish Series[B] (Rego Humic Gleysol)	NSH	285.0	0.29
4. Soils developed on deep (>100 cm) fine loamy (L, CL, SiCL), strongly to extremely calcareous till of limestone and granitic origin.			
a) Well to moderately well drained			
• Hilton Series (Orthic Black)	HIT	3 584.4	3.66
• Tiger Hills Series (Orthic Dark Gray)	TGL	2 427.1	2.48
• Tiger Hills Series, coarse-loamy substrate variant (Orthic Dark Gray)	TGL1	330.0	0.34
b) Imperfectly drained			
• Barwood Series (Gleyed Rego Black)	BWO	456.2	0.47
c) Poorly drained			
• Hickson Series (Rego Humic Gleysol)	HKS	807.4	0.82
5. Soils developed on deep (>100 cm), sandy skeletal (LCS, GrS) moderately to strongly calcareous glaciofluvial deposits.			
a) Rapid to well drained			
• Leary series (Orthic Dark Gray)	LRY	1 585.9	1.62
• Leary Series, coarse-loamy substrate variant (Orthic Dark Gray)	LRY1	245.0	0.25
6. Soils developed on coarse-loamy (SiL, L, SL), moderately to strongly calca-			

reous lacustrine deposits overlying sandy-skeletal (GrS, GrLS) moderately calcareous, mixed glaciofluvial deposits at 25 to 100 cm depth.			
a) Well to moderately well drained			
• Croyon Series (Orthic Black)	CYN	125.4	0.13
• Croyon Series, shale gravel substrate variant (Orthic Black)	CYN1	51.3	0.05
• Vandal Series (Orthic Dark Gray)	VDL	2 540.8	2.59
• Vandal Series, shale gravel substrate variant (Orthic Dark Gray)	VDL1	2 950.3	3.01
• Vandal Series, sandy substrate variant (Orthic Dark Gray)	VDL2	1 533.6	1.56
• Trinton Series (Orthic Dark Gray Luvisol)	TNT	219.2	0.22
b) Imperfectly drained			
• Capell Series (Gleyed Rego Black)	CXT	73.2	0.07
• Vartel Series (Gleyed Dark Gray)	VTL	79.1	0.08
• Vartel Series, shale gravel substrate variant (Gleyed Dark Gray)	VTL1	83.0	0.08
• Druxman Series (Gleyed Black)	DXM	126.7	0.13
c) Poorly drained			
• Carvey Series (Rego Humic Gleysol)	CAV	191.5	0.20
7. Soils developed on deep (>100 cm), fine loamy (CL, SiCL) moderately to strongly calcareous lacustrine deposits.			
a) Well to moderately well drained			
• Ramada Series (Orthic Black)	RAM	687.8	0.70
• Firdale Series (Orthic Dark Gray	FIR	7 107.4	7.25

b) Imperfectly drained			
• Prodan Series (Gleyed Rego Black)	PDA	4 013.6	4.09
• Danlin Series (Gleyed Dark Gray)	DLN	928.4	0.95
• Charman Series (Gleyed Black)	CXV	316.7	0.32
c) Poorly drained			
• Tadpole Series (Rego Humic Gleysol)	TDP	5 171.4	5.27
8. Soils developed on clayey (SiC, C) moderately to strongly calcareous lacustrine deposits overlying coarse loamy and sandy (L, LS), moderately to strongly calcareous lacustrine deposits at 25 to 100 cm depth.			
a) Imperfectly drained			
• Oliver Series (Gleyed Black Solonetz)	OIV	601.7	0.61
9. Soils developed on fine loamy (CL, SiCL), moderately to strongly calcareous lacustrine deposits overlying sandy (LFS, FS, LS), moderately to strongly calcareous fluvial-lacustrine deposits at 25 to 100 cm depth.			
a) Imperfectly drained			
• Crookdale Series (Gleyed Rego Black)	CKD	319.3	0.83
10. Soils developed on deep (>100 cm) coarse to fine loamy (VFSL, SICL), moderately to strongly calcareous alluvial deposits.			
a) Imperfectly drained			
• Levine Series (Gleyed Cumulic Regosol)	LEI	164.2	0.17
11. Soils developed on moderately decomposed fen peat overlying sandy to fine loamy (LS, CL, SiCL), moderately to strongly calcareous, fluvial lacustrine and till deposits at 40 to 160 cm depth.			

a) Poorly to very poorly drained			
• Perillo Series (Terric Mesisol)	PER	1 121.7	1.14
12. Soils developed on deep (>160 cm) moderately decomposed fen peat.			
a) Poorly to very poor drained			
• Xavier (Typic Mesisols)	XVI	49.0	0.05
13. Soils developed on a complex arrangement of undifferentiated materials with a range of drainage, erosion, texture, topography and soil development characteristics adjacent to and including drainage channels.			
a) Variably drained			
• Eroded Slopes Complex	ERX	4 205.0	4.29
14. Non-soil features including townsites, lakes and large ponds.			
	ZZ	1 569.7	1.60
	Swan Lake	792.7	0.81
	Total	98 052.0	99.61

A Gleysolic soils associated with Black Chernozems

B Gleysolic soils associated with Dark Gray Chernozems

* Total does not equal 100% due to "rounding-error"

Altamont Series (ATN)

The Altamont series consists of well to moderately well drained Orthic Dark Gray soil developed on a mantle (25 to 100 cm) of weakly to moderately calcareous, uniform, fine loamy (L, CL, SiCL), lacustrine sediments over moderately to strongly calcareous, deep, uniform fine loamy (L, SiL, CL) mixed till deposits. These soils occur in middle to upper slope positions of very gentle slopes on undulating landscapes and have moderate permeability moderate surface runoff and a low water table during the growing season. Altamont soils are non-eroded, non-stony and non-saline. They have high available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Altamont soil the solum is approximately 60 cm thick. The profile is characterized by a dark gray Ap or Ah horizon, 5 to 15 cm thick, a dark gray Ahe or AB horizon, 10 to 30 cm thick with rinsed ped surfaces, a brown to pale brown BM horizon, 10 to 25 cm thick a transition pale brown II BC horizon 10 to 20 cm thick and occasionally a white IICca horizon 4 to 6 cm thick. The parent material is typically pale brown to very pale strongly calcareous mixed till.

Altamont soils occur in close association with Kingsley, Knudson and Tellier soils. They are similar to Firdale soils by having Orthic Dark Gray profile development in fine loamy lacustrine deposits but differ from Firdale soils because of the substrate of calcareous regional till not present in Firdale soils. Altamont soils were previously mapped as the dominant associate of the Altamont Association in the reconnaissance soil survey of South-Central Manitoba (1943). An example profile of a Altamont soil is presented in Appendix F.

Barwood Series (BWO)

The Barwood series consists of imperfectly drained Gleyed Rego Black soil developed on strongly to extremely calcareous, deep uniform, fine loamy (L, CL, SiCL), boulder till of limestone and granitic origin. These soils occur in toe and lower slope positions of strong slopes on hummocky landscapes and have moderately slow permeability moderately slow surface runoff and a medium water table during the growing season. Barwood soils are non-eroded, slightly stony and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses. The majority of these soils are currently used for improved pasture and grain crop production.

In a representative profile of Barwood soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray to black Ap or Ah horizon, 10 to 15 cm thick, a thin transitional, calcareous AC horizon, 15 to 20 cm thick and a very pale brown extremely calcareous CK horizon, with iron stains. A typical profile also contains lime and manganese concretions at depth.

Barwood soils occur in close association with Hilton and Tiger Hills soils. They are similar to Ferris soils by having a Gleyed Rego Black profile developed in calcareous till but differ from Ferris soils because of the extreme calcareousness of Hilton till material and its relatively shallow profile. Barwood soils were previously mapped as imperfectly drained inclusions of the Hilton Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Capell Series (CXT)

The Capell series consists of imperfectly drained Gleyed Rego Black soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, coarse loamy (SiL, L, SL), lacustrine sediments over moderately to strongly calcareous, deep stratified, sandy to sandy-skeletal (GrS, GrLS), glaciofluvial deposits. These soils occur in lower slope positions of gently to moderate slopes on hummocky landscapes and have moderate over rapid permeability, moderate surface runoff and a medium water table during the growing season. Capell soils are occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Capell soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to black Apk or Ahk horizon, 15 to 25 cm thick, a dark gray to gray, calcareous AC horizon, 5 to 15 cm thick, a light gray IICca horizon, 5 to 10 cm thick with secondary carbonate accumulation and a light yellowish brown IICk horizon with common, distinct iron mottles.

Capell soils occur in close association with Croyon and Carvey soils. They are similar to Druxman soils by having the same sequence of parent materials and the same natural drainage but differ from Druxman soils because of a more weakly developed profile than that typical of Druxman soils. Capell soils were previously mapped as an imperfectly drained associate of the Agassiz Association in the reconnaissance soil survey of South- Central Manitoba (1943).

Carvey Series (CAV)

The Carvey series consists of poorly drained Rego Humic Gleysol soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, coarse loamy (SiL, L, SL) lacustrine sediments over moderately to strongly calcareous, sandy to sandy skeletal glaciofluvial deposits. These soils occur in depressional positions of nearly level slopes on level landscapes and have moderate permeability slow surface runoff and a high water table during the growing season. Carvey soils are occasionally slightly saline. They have medium over low available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation often includes sedges and meadow grasses. The majority of these soils are currently used for natural grazing.

In a representative profile of Carvey soil the solum is approximately 20 cm thick. The profile is characterized by a thin (2 to 5 cm) moderately decomposed LFH horizon a very dark gray, calcareous Ah horizon, 7 to 15 cm thick and a dark gray, calcareous, transition AC horizon, 10 to 20 cm thick, and a pale brown, calcareous IICk horizon with yellowish brown mottles. A typical profile also contains manganese concretions in the subsoil and shells at the surface.

Carvey soils occur in close association with Capell, Druxman and Croyon soils. They are similar to

Tadpole soils by having a Rego Humic Gleysol profile developed in loamy lacustrine deposits, but differ from Tadpole soils by having a sandy to sandy-skeletal substrate within a meter of the mineral surface. Carvey soils were previously mapped as poorly drained inclusions of the heavy association and Indian Springs complex, in the reconnaissance soil survey of South-Central Manitoba (1943).

Cazlake Series (CZK)

The Cazlake series consists of poorly drained Rego Humic Gleysol soil developed on moderately to strongly calcareous (CL, L, SiCL), deep uniform till of mixed limestone granite and shale origin. These soils occur in level to depressional positions of gentle to moderate slopes on hummocky landscapes and have slow permeability very slow surface runoff and a very high water table during the growing season. Cazlake soils are non-eroded, slightly stony and slightly saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, cattails and reeds. The majority of these soils are currently in their natural state due to restricted drainage and high water tables.

In a representative profile of Cazlake soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ap horizon, 15 to 50 cm thick, a light olive gray carbonated AC horizon, 5 to 10 cm thick and a light gray C horizon, with many prominent iron mottles. A typical profile also contains up to 40 cm of inwash at the surface due to upslope soil erosion.

Cazlake soils occur in close association with Darlingford, Nikkel and Ferris soils. They are similar to Horose soils by having the same soil development and parent material but differ from Horose soils because Cazlake soils are associated with Black Chernozems and Horose soils are associated with Dark Gray Chernozems. Cazlake soils were previously mapped as minor poorly drained associates of the Darlingford association in the reconnaissance soil survey of South-Central Manitoba (1943).

Charman Series (CXV)

The Charman series consists of imperfectly drained Gleyed Black soil developed on moderately to strongly calcareous, deep stratified, fine loamy (CL, SiCL), lacustrine deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have moderate permeability, slow surface runoff and a high water table during the growing season. Charman soils are occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Charman soil the solum is approximately 60 cm thick. The profile is characterized by a black Ah or Ap horizon, 15 to 25 cm thick, a dark grayish brown Bmgj horizon, 10 to 30 cm thick with few, faint iron mottles, a transitional, non-calcareous BC horizon, 5 to 10 cm thick and a pale brown Ck horizon with many fine distinct iron mottles. A typical profile also contains a layer of carbonate accumulation, Cca horizon, above the Ck horizon.

Charman soils occur in close association with Ramada, Carroll and Tadpole soils. They are similar to Prodan soils by having the same fine loamy lacustrine parent material and the same natural drainage but differ from Prodan soils in having a B horizon. Prodan soils were previously mapped as minor inclusions of the Carroll association and in deep lacustrine overlay areas of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Crookdale Series (CKD)

The Crookdale series consists of imperfectly drained Gleyed Rego Black soil developed on a mantle (25 to 100 cm) of strongly calcareous, stratified, fine loamy (CL, SiCL) lacustrine sediments over strongly calcareous, deep uniform sandy (LFS, FS, S) fluvial lacustrine deposits. These soils occur in lower slope positions of level to nearly level slopes on level landscapes and have moderate permeability moderately slow surface runoff and a medium water table during the growing season. Crookdale soils are non-eroded, non-stony and slightly saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Crookdale soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah to Ap horizon, 10 to 25 cm thick, a dark grayish brown transitional AC horizon, 10 to 20 cm thick with faint iron mottles, a white Cca horizon, 5 to 10 cm thick of lime accumulation and a light olive brown IICk horizon with prominent iron mottles.

Crookdale soils occur in close association with Wellwood soils. They are similar to Prodan soils by having a Gleyed Rego Black profile developed in fine loamy lacustrine deposits but differ from Prodan soils which develop in deep fine loamy deposits by grading to sandy deposits at depth. Crookdale soils were previously mapped as an associate of the Glenboro association in the reconnaissance soil survey of South-Central Manitoba (1943).

Croyon Series (CYN)

The Croyon series consists of moderately well to well drained Orthic Black soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, coarse-loamy (L, SiL, SL) lacustrine sediments over moderately to strongly calcareous, stratified, deep sandy-skeletal (GrS, GrLS), glacio-fluvial deposits. These soils occur in middle and upper slope positions of very gentle slopes on undulating landscapes and have medium over rapid permeability moderately rapid surface runoff and a low water table during the growing season. Croyon soils have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Croyon soil the solum is approximately 35 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 10 to 15 cm thick, a dark brown Bm horizon, 10 to 25 cm thick, a yellowish brown IICca horizon, 10 to 20 cm thick with secondary carbonate accumulation and a light yellowish brown IICk horizon. The parent material is typically stratified with thin (<5 cm) layers of SiL, CS, GrS and SL textures.

Croyon soils occur in close association with Zarnet, Capell and Druxman soils. They are similar to Vandal soils by having a coarse-loamy mantle over sandy-skeletal deposits at depth but differ from the Orthic Dark Gray Vandal soils in having a less strongly developed Orthic Black soil profile. Croyon soils were previously mapped as loamy surface associates of the Agassiz association and gravelly substrate inclusions of the Indian Springs complex, in the reconnaissance soil survey of South-Central Manitoba (1943).

Croyon Series, shale gravel substrate variant (CYN1)

The Croyon series shale gravel variant, occurs in close association with typical Vandal soils and differs in having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

Danlin Series (DLN)

The Danlin series consists of imperfectly drained Gleyed Dark Gray soil developed on moderately to strongly calcareous, deep, uniform, fine loamy (CL, SiCL), lacustrine deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have moderate permeability moderately slow surface runoff and a high water table during the growing season. Danlin soils are occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed by aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Danlin soil the solum is approximately 75 cm thick. The profile is characterized by a dark gray Ah or Ap horizon, 10 to 15 cm thick, a dark grayish brown transitional AB horizon, 10 to 15 cm thick, a grayish brown Btj horizon, 15 to 25 cm thick and a light brown Ck horizon with numerous distinct iron mottles. A typical profile also contains a Cca horizon of lime accumulation above the Ck horizon.

Danlin soils occur in close association with Firdale soils. They are similar to Vartel soils by having a Gleyed Dark Gray profile in fine loamy lacustrine sediments but differ from them in having a sandy- skeletal substrate within a meter of the mineral surface. Danlin soils were previously mapped as minor associates of the Carroll or Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Darlingford Series (DGF)

The Darlingford series consists of well drained Orthic Black soil developed on moderately to strongly calcareous, deep, uniform, fine loamy and coarse loamy (LiCL, SiCL), nearly stone-free mixed till deposits. These soils occur in middle to upper positions of very gently to gentle slopes on undulating to rolling landscapes and have medium to moderately slow permeability moderate surface runoff and a medium water table during the growing season. Darlingford soils are slightly eroded and slightly stony. They have moderate available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen poplar stands. The majority of these soils are currently used for grain crop production.

In a representative profile of Darlingford soil the solum is approximately 60 cm thick. The profile is characterized by a very dark gray Ap or Ah horizon, 15 to 20 cm thick, a black Ah horizon, 5 to 10 cm thick, a brown to dark brown Bm or Btj horizon, 20 to 30 cm thick and a pale brown Cca horizon 10 to 15 cm thick. The parent material is typically yellowish brown mixed till with few coarse fragments.

Darlingford soils occur in close association with Dezwood, Nikkel and Cazlake soils. They are similar to Nikkel soils by having a dark surface layer and well developed B horizon but differ from Nikkel soils by being well drained while Nikkel soils are imperfectly drained. Darlingford soils were previously mapped as the dominant associate of the Darlingford association in the reconnaissance soil survey of South- Central Manitoba (1943).

An example profile of a Darlingford soil is presented in Appendix F.

Dezwood Series (DZW)

The Dezwood series consists of moderately well to well drained soil developed on moderately to strongly calcareous, deep, uniform, fine loamy and coarse loamy (L, CL, SiCL) mixed shale, limestone and granite till deposits. These soils occur in middle and upper positions of gentle to moderate slopes on hummocky landscapes and have medium to moderately slow permeability moderate to rapid surface runoff and a medium water table during the growing season. Dezwood soils are slightly eroded and slightly stony. They have medium available water holding capacity, medium organic matter content, and medium to high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-popular groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Dezwood soil the solum is approximately 40 cm thick. The profile is characterized by a dark grayish brown Ah or Ap horizon, 15 to 20 cm thick, occasionally a thin light gray Ae horizon, 2 to 4 cm thick, a pale brown Bt horizon, 20 to 40 cm thick, and a light gray Cca horizon 15 to 30 cm thick. The parent material is typically light gray mixed till with few coarse fragments.

Dezwood soils occur in close association with Ferris, Zaplin and Nikkel soils. They are similar to Pembina soils by having been developed in a calcareous mixed regional till but differ from them by having a luvisolic Ae horizon greater than 5 cm thick occurring in undisturbed profiles. Dezwood soils were previously mapped as gray black associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Dezwood soil is presented in Appendix F.

Druxman Series (DXM)

The Druxman series consists of imperfectly drained Gleyed Black soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, deep, sandy-skeletal (GrS, GrLS), glacio-fluvial deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have medium over rapid permeability, moderately slow surface runoff and a medium water table during the growing season. Druxman soils have medium available water holding capacity, medium organic matter content and medium natural fertility. Native vegetation often includes meadow and tall prairie grasses interspersed with willow clumps. The majority of these soils are currently used for grain crop production.

In a representative profile of Druxman soil the solum is approximately 50 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 15 to 25 cm thick, a dark yellowish brown to olive brown Bm horizon, 20 to 30 cm thick with many, fine, distinct, yellowish brown iron mottles, a transitional dark yellowish brown BC, 5 to 10 cm thick, occasionally a yellowish brown IICca horizon, 5 to 10 cm thick and light yellowish brown IICk horizon with many, large prominent iron mottles.

Druxman soils occur in close association with Croyon and Carvey soils. They are similar to Capell soils by having an imperfectly drained Black profile developed in loamy over sandy-skeletal deposits but differ from Capell soils because Capell soils lack a Bm horizon. Druxman soils were previously mapped as imperfectly drained associates of the Agassiz association and unidentified inclusions of the Indian Springs complex in the reconnaissance soil survey of South-Central Manitoba (1943).

Ferris Series (FRS)

The Ferris series consists of imperfectly drained Gleyed Rego Black soil developed on moderately to strongly calcareous deep, uniform, fine loamy and fine silty slightly stony mixed till deposits. These soils occur in lower positions of very gentle slopes on undulating landscape and have moderately slow permeability slow surface runoff and a medium water table during the growing season. Ferris soils are non-eroded, non-stony and slightly saline. They have high available water holding capacity, high organic matter content, and high natural fertility.

In a representative profile of Ferris soil the solum is approximately 30 cm thick. The profile is characterized by black, carbonated Ap horizon, 25 to 35 cm thick, a dark gray, transitional AC horizon, 15 to 30 cm thick with iron mottles, and a light gray to pale yellow Cca horizon 10 to 15 cm thick with lime accumulation. The parent material is typically light yellowish brown mixed till with iron mottles.

Ferris soils occur in close association with Zaplin and Nikkel soils. They are similar to Joyale soils by having a Gleyed Rego Black profile and mixed till at depth but differ because of a fine loamy lacustrine veneer (30 to 90 cm thick) overlying the mixed till. Ferris soils were previously mapped as imperfectly drained blackearth associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Ferris soil is presented in Appendix F.

Fifere Series (FFR)

The Fifere series consists of well drained Orthic Dark Gray soil developed on weakly calcareous to neutral, shallow uniform, fine loamy and fine silty (SiL, L, CL) till derived from shale bedrock. These soils occur in upper positions of gentle to moderate slopes on hummocky and ridged landscapes and have moderate permeability moderate to rapid surface runoff and a low water table during the growing season. Fifere soils are moderately eroded. They have low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes oak aspen-popular and shrubs. The majority of these soils are currently used for grain crop production.

In a representative profile of Fifere soil the solum is approximately 70 cm thick. The profile is characterized by a gray brown Ap or Ah horizon, 15 to 18 cm thick, a light brownish gray Bt horizon, 25 to 35 cm thick and a light grayish brown transitional BC horizon, 10 to 30 cm thick. The parent material is typically light grayish brown non-calcareous shale till. A typical profile also contains numerous shale fragments of various size throughout.

Fifere soils occur in close association with Manitou, Nayler and Fresno soils. They are similar to Nayler soils by having a profile developed in well drained, non-calcareous shale till but differ from Nayler soils because of the absence of an Ae horizon greater than 5 cm in thickness. Fifere soils were previously mapped as associates of the Manitou association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Fifere soil is presented in Appendix F.

Firdale Series (FIR)

The Firdale series consists of moderately well to well drained Orthic Dark Gray soil developed on moderately to strongly calcareous, deep, uniform, fine loamy (CL, SiCL) lacustrine deposits. These soils occur in middle and upper positions of very gentle slopes on rolling to hummocky landscapes and have a medium water table during the growing season. Firdale soils are slightly to moderately eroded, non-stony and non-saline. They have high available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes aspen, oak and shrubs. The majority of these soils are currently used for grain crop production.

In a representative profile of Firdale soil the solum is approximately 60 cm thick. The profile is characterized by a dark grayish brown Ap or Ah horizon, 15 to 25 cm thick, a grayish brown Bt or Bm horizon, 20 to 35 cm thick, a light olive brown Cca horizon, 5 to 15 cm thick, with and a very pale brown, calcareous C horizon.

Firdale soils occur in close association with Danlin, Charman and Tadpole soils. They are similar to Altamont soils by having an Orthic Dark Gray soil profile developed in fine loamy and silty deposits but differ by having glacial till within a meter of the surface. Firdale soils were previously mapped as deep lacustrine associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Firdale soil is presented in Appendix F.

Fresno Series (FSO)

The Fresno series consists of imperfectly drained Gleyed Dark Gray soil developed on weakly calcareous to neutral, shallow uniform, fine loamy and fine silty (SiL, L, CL), till derived from shale bedrock. These soils occur in lower slope positions of gentle to moderate slopes on hummocky and ridged landscapes and have moderate permeability moderately slow surface runoff and a high water table during the growing season. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Fresno soil the solum is approximately 70 cm thick. The profile is characterized by a grayish brown Ap or Ah horizon, 15 to 20 cm thick, an Ahe or transitional AB horizon, 15 to 25 cm thick with rinsed ped surfaces, a light grayish brown Bm or Bt horizon, 25 to 35 cm thick with a few, fine, faint iron mottles and a light grayish brown transitional BC horizon 10 to 20 cm thick with a few, fine faint iron mottles. The parent material is typically light grayish brown, noncalcareous shale till with medium distinct mottles.

Fresno soils occur in close association with Nayler and Fifere soils. They are similar to Zaplin soils by having an imperfectly drained Gleyed Dark Gray profile but differ from them in having a much higher content of shale bedrock derived material in their parent material. Fresno soils were previously mapped as imperfectly drained associates of the Snowflake association in the reconnaissance soil survey of South-Central (1943).

Guerra Series (GRR)

The Guerra series consists of poorly drained Rego Humic Gleysol soil developed on a mantle (35 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (CL, L, SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (CL, L, SiCL), mixed till deposits. These soils occur in level to depressional positions of very gentle slopes on hummocky landscapes and have slow permeability very slow surface runoff and a high water table during the growing season. Guerra soils are occasionally slightly saline. They have a medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, rushes and willows. The majority of these soils are currently used for natural grazing.

In a representative profile of Guerra soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ahk horizon, 15 to 30 cm thick, a very dark gray transitional AC horizon, 5 to 15 cm thick with many prominent iron mottles, and a dark olive gray Ck horizon with many prominent iron mottles. The parent material is relatively free of coarse fragments.

Guerra soils occur in close association with Knudson, Joyale and Ullrich soils. They are similar to Narish soils by having a Rego Humic Gleysol profile developed in mixed calcareous till but differ from Narish soils because Narish profiles are associated with Dark Gray soils while Guerra profiles are associated with Black soils. Guerra soils were previously mapped as the poorly drained blackearth associate of the Altamont association, in the reconnaissance soil survey of South-Central Manitoba (1943).

Hickson Series (HKS)

The Hickson series consists of poorly drained Rego Humic Gleysol soil developed on very strongly to extremely calcareous, thin, uniform, fine loamy (L, CL, SiCL), boulder till of limestone and granitic origin. These soils occur in level to depressional positions of moderate slopes on hummocky landscapes and have very slow permeability very slow surface runoff and a high water table during the growing season. Hickson soils are non-eroded, slightly stony and slightly saline. They have medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, reeds, and willows. The majority of these soils are currently under native conditions.

In a representative profile of Hickson soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ahk horizon, 20 to 35 cm thick, an olive gray transitional AC horizon, 5 to 15 cm thick with many distinct iron mottles, and a pale olive Ck horizon with many prominent iron mottles.

Hickson soils occur in close association with Hilton and Barwood soils. They are similar to Cazlake soils by having a Rego Humic Gleysol profile developed in fine-loamy till but differ from them in having a significantly higher content of calcium carbonate in their parent material. Hickson soils were previously mapped as poorly drained associates of the Hilton association in the reconnaissance soil survey of South-Central Manitoba (1943).

Hilton Series (HIT)

The Hilton series consists of well drained Orthic Black soil developed on strongly to extremely calcareous, thin, uniform, fine loamy (L, CL, SiCL) boulder till of limestone and granite origin. These soils occur in upper slope positions of moderate slopes on hummocky landscapes and have moderate permeability rapid surface runoff and a low water table during the growing season. Hilton soils are moderately eroded, moderately stony and non-saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for forage crop production and improved pasture.

In a representative profile of Hilton soil the solum is approximately 30 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 10 to 20 cm thick, a dark brown Bm horizon, 5 to 15 cm thick, a very pale brown Cca horizon, 10 to 40 cm thick and a yellowish brown Ck horizon. The parent material is typically very stony. A typical profile also contains appreciable amounts of unaltered carbonate minerals.

Hilton soils occur in close association with Barwood and Hickson soils. They are similar to Tiger Hills soils by having a well drained, very thin soil profile developed in strongly to extremely calcareous glacial till but differ from them in having a less strongly leached soil profile. Tiger Hills soils have eluvial Ae or Ahe horizons and illuvial Bt horizons while Hilton soils do not. Hilton soils were previously mapped as dominant associates of the Hilton association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Hilton soil is presented in Appendix F.

Horose Series (HOS)

The Horose series consists of poorly drained Rego Humic Gleysol soil developed on moderately to strongly calcareous, deep, uniform, fine loamy and coarse loamy (L, CL, SICL) mixed till of limestone, granite and shale origin. These soils occur in level to depressional positions of moderate slopes on hummocky landscapes and have very slow permeability very slow surface runoff and a high water table during the growing season. Horose soils are non-eroded, slightly stony and slightly saline. They have medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, reeds and willows. The majority of these soils are currently under natural conditions.

In a representative profile of Horose soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ahk horizon, 20 to 35 cm thick, a light olive brown AC horizon, 5 to 10 cm thick, and a light yellowish brown Ck horizon with many, large, prominent iron mottles. A typical profile also contains a Cca horizon, 5 to 10 cm thick below the AC horizon.

Horose soils occur in close association with Dezwood, Pembina and Zaplin soils. They are similar to Cazlake soils by having the same Rego Humic Gleysol profile development and poor drainage but differ from Cazlake soils because the Horose series is associated with Dark Gray soils while the Cazlake series is associated with Black soils. Horose soils were previously mapped as poorly drained associates of the Pembina association, in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Horose soil is presented in Appendix F.

Joyale Series (JYL)

The Joyale series consists of imperfectly drained Gleyed Rego Black soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (L, CL, SICL), lacustrine deposits over moderately to very strongly calcareous, deep uniform, fine loamy (CL, SICL), mixed till deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have moderate permeability slow surface runoff and a medium water table during the growing season. Joyale soils are usually slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Joyale soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to black Apk or Ahk horizon, 15 to 25 cm thick, a light gray Cca or AC horizon, 5 to 15 cm thick with distinct iron mottles, and a very pale brown IICk horizon with many prominent iron mottles. A typical profile also contains a thin pebble line at the lacustrine/till contact.

Joyale soils occur in close association with Knudson, Ullrich and Guerra soils. They are similar to Prodan soils by having a Gleyed Rego Black profile developed dominantly in imperfectly drained fine loamy deposits but differ from Prodan soils because of the presence of a compact till substrate within a meter of the mineral surface. Joyale soils were previously mapped as minor, imperfectly drained blackearth associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Joyale soil is presented in Appendix F.

Kingsley Series (KIS)

The Kingsley series consists of moderately well to well drained Orthic Dark Gray Luvisol soil developed on a mantle (25 to 100 cm) of weakly to moderately calcareous, uniform, fine loamy (CL, SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (CL, L), mixed till deposits. These soils occur in upper slope positions of very gentle slopes on hummocky landscapes and have moderate permeability, moderate surface runoff and a low water table during the growing season. Kingsley soils are slightly water eroded. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes forests of burr oak and aspen. The majority of these soils are currently used for grain crop production.

In a representative profile of Kingsley soil the solum is approximately 60 cm thick. The profile is characterized by a grayish brown Ahe or Ap horizon, 10 to 20 cm thick, a light gray Ae horizon, 10 to 15 cm thick with fine platy structure, a light yellowish brown, transitional AB horizon, 10 to 25 cm thick, a pale brown Bt horizon, 5 to 15 cm thick with clay skins, a light yellowish brown transitional IIBC horizon, 10 to 20 cm thick, and a very pale brown IICk horizon. The till substrate is commonly mixed till but can also be dominantly shaley till.

Kingsley soils occur in close association with Altamont soils. They are similar to Trinton soils by having a Orthic Dark Gray Luvisol profile developed dominantly in fine-loamy lacustrine deposits, but differ from Trinton soils in not having a sandy-skeletal substrate within a meter of the mineral surface. Kingsley soils were previously mapped as gray-wooded associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Kingsley soil is presented in Appendix F.

Knudson Series (KUD)

The Knudson series consists of moderately well to well drained Orthic Black soil developed on a shallow mantle (30 to 100 cm) of weakly to moderately calcareous thin, uniform, fine loamy to clayey, glaciolacustrine deposit, over moderately to strongly calcareous, deep, uniform, fine loamy to fine silty mixed till deposits. These soils occur in middle positions of very gentle slopes on undulating landscape and have medium permeability, moderate surface runoff and a medium water table during the growing season. Knudson soils have moderate available water holding capacity, moderate organic matter content, and high natural fertility.

In a representative profile of Knudson soil the solum is approximately 60 cm thick. The profile is characterized by a black Ap horizon, 15 to 25 cm thick, with a brown to grayish brown Bm horizon 8 to 12 cm thick with medium subangular blocky structure, a very pale brown Cca horizon 6 to 10 cm thick, and a yellowish brown IICk horizon. A typical profile also contains a thin pebble line at the lacustrine-till interface.

Knudson soils occur in close association with Joyale and Guerra soils. They are similar to Darlingford soils by having similar profile characteristics but differ from them in having a thin mantle of fine loamy to clayey glaciolacustrine deposits overlying glacial till. Knudson soils were previously mapped as blackearth associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Knudson soil is presented in Appendix F.

Leary Series (LRY)

The Leary series consists of well to rapidly drained Orthic Dark Gray soil developed on moderately to strongly calcareous, deep, stratified, sandy to sandy-skeletal (LCS, GrLS), glaciofluvial deposits. These soils occur in middle to upper slope positions of moderate slopes on hummocky landscapes and have very rapid permeability moderate surface runoff and a low water table during the growing season. Leary soils have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes forests of dominantly burr oak. The majority of these soils are currently excavated for road construction and the aggregate industry.

In a representative profile of Leary soil the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ah or Ap horizon, 10 to 20 cm thick, a dark brown Bt or Btj horizon, 5 to 20 cm thick, a brown transitional BC horizon, 15 to 30 cm thick and a light yellowish brown Ck horizon with thin layers of coarse sand, fine sand and gravel

Leary soils are similar to Vandal soils by having an Orthic Dark Gray soil profile and sandy-skeletal substrate material but differ from Vandal soils in not having 25 to 100 cm of loamy surface over the sandy-skeletal substrate. Leary soils were previously mapped as the dominant associate of the Leary association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Leary soil is presented in Appendix F.

Leary Series, coarse-loamy substrate variant (LRY1)

The Leary series, coarse-loamy (SIL, VFSL) substrate variant, occurs in close association with typical Vandal soils and differs from them in having a light yellowish brown, relatively stone-free coarse-loamy substrate.

Levine Series (LEI)

The Levine series consists of imperfectly drained Gleyed Cumulic Regosol soil developed on moderately to strongly calcareous, deep, stratified, coarse to fine loamy (VFSL, L, [illegible]) recent alluvial deposits. These soils occur in flood plains associated with the Cypress River on level slopes in level landscapes. They have rapid permeability, moderately slow surface runoff and a medium water table during the growing season. Levine soils are occasionally slightly saline and are subject to periodic inundation during spring runoff or after heavy rains. They have a moderate to low available water holding capacity, low organic matter content and medium natural fertility. The majority of these soils are currently used for grain crop production.

In a representative profile of Levine soil the solum is approximately 15 cm thick. The profile is characterized by a dark gray Apk or Ahk horizon 10 to 20 cm thick and a light yellowish brown Ck horizon. The underlying strata may vary in colour from light to dark. The thin dark colored mineral and organic layers are former surface horizons that have been exposed to soil forming processes for a significant period before burial by alluvial deposits. Medium, distinct yellowish brown iron mottles occur through the soil.

Levine soils were previously mapped as inclusions of Eroded Slope Complexes in the reconnaissance soil survey of South-Central Manitoba.

Manitou Series (MXS)

The Manitou series consists of well drained Orthic Black soil developed on weakly calcareous to neutral, deep, uniform, fine loamy and fine silty (CL, L, SiL) glacial till derived predominantly from shale bedrock deposits. These soils occur in middle and upper positions of very gentle slopes on undulating landscapes and have medium permeability moderate surface runoff and a medium water table during the growing season. Manitou soils are slightly eroded and non-stony. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Manitou soil the solum is approximately 75 cm thick. The profile is characterized by a very dark gray Ap or Ah horizon, 15 to 20 cm thick, with fine shale flakes, a dark gray Bm horizon, 20 to 60 cm thick and a transitional BC horizon, 10 to 15 cm thick. The parent material is typically light gray non-calcareous till derived from shale.

Manitou soils occur in close association with Fifere and Darlingford soils. They are similar to Fifere soils by having shale till parent material but differ from Fifere soils because of their relatively darker surface color and lack of Bt horizon. Manitou soils were previously mapped as the dominant associate of the Manitou association in the reconnaissance soil survey of South-Central Manitoba (1943).

Narish Series (NSH)

The Narish series consists of poorly drained Rego Humic Gleysol soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (CL, L, SICL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (CL, L, SICL), mixed till deposits. These soils occur in level to depressional positions of very gentle slopes on hummocky landscapes and have slow permeability very slow surface runoff and a high water table during the growing season. Guerra soils are occasionally slightly saline. They have a medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, rushes and willows. The majority of these soils are currently used for natural grazing.

In a representative profile of Guerra soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ahk horizon, 15 to 30 cm thick, a very dark gray transitional AC horizon, 5 to 15 cm thick with many, fine, prominent iron mottles, and a dark olive gray C horizon with many, fine prominent, iron mottles. The parent material is typically relatively free of coarse fragments.

Narish soils occur in close association with Altamont and Tellier soils. Narish soils are virtually the same as Guerra soils differing from them only because they occur in close association with Dark Gray soils found in locally more cool soil climate areas. Narish soils were previously mapped as poorly drained minor associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Nayler Series (NYO)

The Nayler series consists of well to rapidly drained Orthic Dark Gray Luvisol soil developed on weakly calcareous to neutral, uniform, deep, fine loamy to fine silty (SIL, L, CL), glacial till of shale bedrock origin. These soils occur in upper slope and crest positions of gentle to moderate slopes on hummocky to ridged landscapes and have rapid permeability rapid surface runoff and a low water table during the growing season. Nayler soils are slightly eroded, slightly stony and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes forests of burr oak and aspen poplar. The majority of these soils are currently used for improved pasture and forage crop production.

In a representative profile of Nayler soil the solum is approximately 90 cm thick. The profile is characterized by a gray brown Ap or Ah horizon, 15 to 20 cm thick, a light yellowish brown Ae horizon, 5 to 30 cm thick with fine, platy structure, a light yellowish gray Bt horizon 20 to 60 cm thick with thin clay skins and a yellowish brown non-calcareous C horizon. The parent material is typically composed of gray shaly till containing weathered Odanah shale fragments.

Nayler soils occur in close association with Fifere and Fresno soils. They are similar to Fifere soils by having well drained profiles developed in non-calcareous shale till but differ from Fifere soils by possessing Ae horizons below their Ap or Ahe horizons at least 5 cm thick. Nayler soils were previously mapped as gray-wooded associates of the Snowflake association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Nayler soil is presented in Appendix F.

Nikkel Series (NKK)

The Nikkel series consists of imperfectly drained Gleyed Black soil developed on moderately to strongly calcareous deep, uniform, fine loamy and coarse loamy (L, CL, SICL), mixed till deposits of granite, limestone and shale origin. These soils occur in lower slope positions of gentle slopes on hummocky landscapes and have moderate permeability moderately slow surface runoff and a medium water table during the growing season. Nikkel soils are non-eroded, slightly stony and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Nikkel soil the solum is approximately 45 cm thick. The profile is characterized by a black Ap or Ah horizon, 20 to 25 cm thick, a dark grayish brown Bm horizon, 5 to 15 cm thick with many, faint, fine iron mottles, a light gray Cca horizon, 5 to 10 cm thick of lime accumulation and a pale brown Ck horizon with many, fine, distinct iron mottles. The parent material is typically relatively stone-free.

Nikkel soils occur in close association with Darlingford, Ferris and Cazlake soils. They are similar to Ullrich soils by having Gleyed Black profile and a fine-loamy till substrate but differ from them in not having 25 to 100 cm of lacustrine veneer overlying the till substrate. Nikkel soils were previously mapped as imperfectly drained blackearth associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba.

Oliver Series (OIV)

The Oliver series consists of imperfectly drained Gleyed Black Solonetz soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, clayey (SiC, C), lacustrine deposits over moderately to strongly calcareous, stratified, deep coarse loamy to sandy (L, SL, LS) lacustrine deposits. These soils occur in middle slope positions of very gentle slopes on level landscapes and have slow permeability very slow surface runoff and a high water table during the growing season. Oliver soils are non-eroded, non-stony and slightly saline. They have a high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and salt-tolerant grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Oliver soil the solum is approximately 60 cm thick. The profile is characterized by a very dark gray to black Ap or Ah horizon, 10 to 20 cm thick, a dark grayish brown Bn or Bnt horizon, 15 to 25 cm thick with very strong columnar to massive structure a very dark grayish brown transitional BC horizon, 10 to 15 cm thick and a yellowish brown C horizon with many distinct iron mottles. The parent material is typically saline at depth. A typical profile also contains gypsum crystals in the C horizon

Oliver soils were previously mapped as the dominant associate of the Oliver association in the reconnaissance soil survey of South-Central Manitoba (1943).

Pembina Series (PBI)

The Pembina series consists of moderately well to well drained Dark Gray Luvisol soil developed on moderately to very strongly calcareous, deep, uniform, loamy, mixed till deposits. These soils occur in middle to upper positions of moderate to strong slopes on hummocky landscape and have moderate permeability rapid surface runoff and a low water table during the growing season. Pembina soils are moderately to severely eroded in upper slope positions, slightly stony and non-saline. They have high available water holding capacity, moderate organic matter content and moderate natural fertility.

In a representative profile of Pembina soil the solum is approximately 50 cm thick. The profile is characterized by a dark grayish brown Ah or Ap horizon, 15 to 20 cm thick, a light gray Ae horizon, 5 to 8 cm thick with platy structure, a brown to pale brown, clay loam to silty clay textured Bt horizon 15 to 30 cm thick and a white Cca horizon of lime accumulation.

Pembina soils occur in close association with Dezwood, Vandal and Firdale soils. They are similar to Poyser soils by having a luvisolic profile developed in mixed till but differ from them because of an Ah or Ahe horizon more than 5 cm thick in undisturbed profiles. Pembina soils were previously mapped as the well drained, dominant associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Pembina soil is presented in Appendix F.

Pembina Series coarse-loamy substrate variant (PBI1)

The Pembina series coarse-loamy (L, SIL, VFSL) substrate variant, occurs in close association with typical Pembina soils and differs from them in having light yellowish brown, relatively stone-free, coarse-loamy substrate material within a meter of the soil surface.

Pembina Series, sandy-skeletal substrate variant (PBI2)

The Pembina series, sandy-skeletal (LCS, GrS, LGrS), substrate variant, occurs in close association with Pembina soils and differs from them in having sandy-skeletal substrate material of glacio-fluvial origin within a meter of the mineral surface.

Perillo Series (PER)

The Perillo series consists of very poorly drained Terric Mesiscl soil developed on a mantle (40 to 160 cm) of moderately decomposed organic, material composed of fen peat over moderately to strongly calcareous, deep, uniform, coarse loamy (L, SiL, VFSL), lacustrine deposits. These soils occur in depressional positions of nearly level slopes on rolling to hummocky landscapes and have slow permeability very slow surface runoff and a very high water table during the growing season. Perillo soils are occasionally slightly saline. They have a high available water holding capacity, very high organic matter content, and low natural fertility. Native vegetation often includes sedges, reeds, and clumps of willow or swamp birch. The majority of these soils are currently used for natural grazing.

In a representative profile of Perillo soil the solum is approximately 50 cm thick. The profile is characterized by a black Om horizon, 5 to 15 cm thick, a black Oh horizon, 20 to 45 cm thick, a black Ah horizon, 15 to 25 cm thick, with a few large iron mottles and a light brownish gray AC horizon 10 to 25 cm thick, with many large prominent iron mottles. The mineral soil parent material is typically light gray in color with numerous prominent mottles and manganese concretions. A typical profile also contains snail shells on the surface and throughout the profile.

Perillo soils occur in association with sloughs, lakes and areas of restricted drainage. They are similar to Tadpole peaty phase soils but differ from them in having an organic surface horizon greater than 40 cm thick to the mineral soil substrate. Perillo soils were previously mapped as meadow or marsh inclusions of many soil associates in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Perillo soil is presented in Appendix F.

Poyser Series (PYR)

The Poyser series consists of well drained Orthic Gray Luvisol soil developed on moderately to strongly calcareous, deep, uniform, fine to coarse loamy (L, CL, SiCL) mixed till deposits. These soils occur in upper slope and crest positions of moderate slopes on hummocky landscapes and have moderate permeability rapid surface runoff and a low water table during the growing season. Poyser soils are moderately eroded, moderately stony and non-saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Poyser soil the solum is approximately 50 cm thick. The profile is characterized by a gray Ap or Ah horizon, 10 to 20 cm thick, a light grayish brown Ae horizon, 5 to 10 cm thick with thin platy structure, a dark brown transitional AB horizon, 10 to 15 cm thick and a dark brown Bt horizon 15 to 20 cm thick with thick clay skins. The parent material is typically yellowish brown calcareous till. Poyser soils are similar to Nayler soils by having a well drained Dark Gray Luvisol profile developed in fine loamy till deposits but differ from them in having been developed in mixed till rather than dominantly shaly till. Poyser soils were previously mapped as gray-wooded associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

Poyser Series, coarse-loamy substrate variant (PYR1)

The Poyser series, coarse-loamy (L, SIL, VFSL) substrate variant, occurs in close association with typical Poyser soils and differs in having a light yellowish brown relatively stone-free, coarse-loamy substrate material within a meter of the mineral surface.

Poyser Series, sandy-skeletal substrate variant (PYR2)

The Poyser series, sandy-skeletal (LCS, GrS, LGrS), substrate variant, occurs in close association with Poyser soils and differs from them in having sandy-skeletal substrate material of glacio-fluvial origin within a meter of the mineral surface.

Prodan Series (PDA)

The Prodan series consists of imperfectly drained Gleyed Rego Black soil developed on moderately to strongly calcareous, deep, uniform, fine loamy (CL, SICL) lacustrine deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have moderately slow permeability, moderately slow surface runoff and a medium water table during the growing season. Prodan soils are non-eroded, non-stony and occasionally slightly saline. They have a high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Prodan soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray Ahk or Apk horizon, 15 to 25 cm thick, a grayish brown transitional AC horizon, 10 to 20 cm thick with a few distinct iron mottles, and a light brownish gray Ck horizon with many distinct iron mottles. A typical profile also contains a light gray Cca horizon of lime accumulation, 5 to 10 cm thick above the C horizon.

Prodan soils occur in close association with Ramada, Charman and Tadpole soils. They are similar to Joyale soils by having a Gleyed Rego Black profile developed dominantly in fine-loamy lacustrine sediments but differ from them in not having a fine-loamy till substrate within a meter of the mineral surface. Prodan soils were previously mapped as imperfectly drained associates of the Carroll and Altamont associations in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Prodan soil is presented in Appendix F.

Ramada Series (RAM)

The Ramada series consists of moderately well to well drained Orthic Black soil developed on moderately to strongly calcareous, deep, uniform, fine loamy (SICL, CL) lacustrine deposits. These soils occur in upper slope positions of very gentle slopes on undulating landscapes and have moderate permeability moderate surface runoff and a medium water table during the growing season. The Ramada soils have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Ramada soil the solum is approximately 40 cm thick. The profile is characterized by a very dark gray Ap or Ah horizon, 15 to 20 cm thick, a dark grayish brown Bm horizon, 10 to 15 cm thick, a transitional, calcareous BC horizon, 5 to 10 cm thick and a pale brown to light yellowish brown Ck horizon. A typical profile usually contains a Cca horizon, 5 to 10 cm thick above the C horizon.

Ramada soils occur in close association with Carroll, Prodan and Charman soils. They are similar to Knudson soils by having well drained Orthic Black profiles developed dominantly in fine loamy lacustrine deposits but differ from them in not having a fine loamy till substrate within a meter of the mineral surface. Ramada soils were previously mapped as the well drained associate of the Carroll association in the reconnaissance soil survey of South-Central Manitoba (1943).

Tadpole Series (TDP)

The Tadpole series consists of poorly drained Rego Humic Gleysol soil developed on strongly calcareous, deep, uniform, fine loamy (CL, SiCL) lacustrine deposits. These soils occur in depressional positions of level slopes on gently undulating landscapes and have very slow permeability very slow surface runoff and a high water table during the growing season. Tadpole soils are non-eroded, non-stony and slightly saline. They have high available water holding capacity, high organic matter content, and low natural fertility.

Native vegetation often includes sedges, meadow grasses and willows. The majority of these soils are currently used for natural grazing or excavation sites for farm ponds.

In a representative profile of Tadpole soils the solum is approximately 50 cm thick. The profile is characterized by a black carbonated Ah or Ahk horizon, 20 to 30 cm thick, and a dark gray, carbonated AC horizon, 20 to 30 cm thick with a few fine prominent mottles. The parent material is typically an olive gray calcareous deposit with many prominent mottles.

Tadpole soils occur in close association with Firdale, Charman and Danlin soils. They are similar to Guerra soils by having a Rego Humic Gleysol profile but differ from them in having a till substrate occurring within a meter of the mineral surface. Tadpole soils were previously mapped as minor poorly drained associates of the Carroll and Altamont associations in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Tadpole soil is presented in Appendix F.

Tadpole series peaty variant (TDPp)

The Tadpole series peaty variant, occurs in close association with typical Tadpole soils and differs in having 25 to 40 cm of organic surface deposits over the normal mineral soil profile.

Tellier Series (TLI)

The Tellier series consists of imperfectly drained Gleyed Dark Gray soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (L, CL, SICL), lacustrine deposits over moderately to strongly calcareous, deep, uniform fine loamy (CL, L, SICL) mixed till deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have moderate permeability moderate surface runoff and a medium water table during the growing season. Tellier soils have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Tellier soil the solum is approximately 45 cm thick. The profile is characterized by dark gray Ap or Ah horizon, 10 to 20 cm thick, a very dark brown Bt or Btj horizon, 20 to 30 cm thick with a few fine faint iron mottles, a grayish brown, carbonated, transitional IIBC horizon, 10 to 15 cm thick and a dark yellowish brown IICk horizon with common, distinct, fine iron mottles.

Tellier soils occur in close association with Altamont and Narish soils. They are similar to Zaplin soils by having a Gleyed Dark Gray profile and a fine loamy till substrate but differ from them in not having a lacustrine mantle over the till substrate. Tellier soils were previously mapped as minor imperfectly drained associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943)'

Tiger Hills Series (TGL)

The Tiger Hills series consists of well drained Orthic Dark Gray soil developed on very strongly to extremely calcareous, thin, uniform, fine loamy (L, CL, SICL), boulder till of limestone and granite origin. These soils occur in upper slope and crest positions of moderate slopes on hummocky landscapes and have moderate permeability rapid surface runoff and a low water table during the growing season. Tiger Hills soils are moderately eroded, moderately stony and non-saline. They have a medium available water holding capacity, low organic matter content, and medium natural fertility. Native vegetation often includes forest of burr oak and aspen poplar. The majority of these soils are currently used for improved grazing and forage crop production.

In a representative profile of Tiger Hills soil the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ah or Ap horizon, 10 to 15 cm thick, a light gray Ahe or Aej horizon, 5 to 10 cm thick, a dark brown Bt or Btj horizon, 15 to 20 cm thick a brown transition BC horizon 5 to 10 cm thick. The parent material is typically yellowish brown calcareous till.

Tiger Hills soils occur in close association with Hilton and Barwood soils. They are similar to Dezwood soils by having an Orthic Dark Gray profile developed in fine loamy till deposits. However they differ from Dezwood soils because the till deposits of Dezwood soils are moderately to strongly calcareous while Tiger Hills deposits are very strongly to extremely calcareous. Tiger Hills soils were previously mapped as the gray-black associate of the Hilton association in the reconnaissance soil survey of South-Central Manitoba (1943).

Tiger Hills Series , coarse-loamy substrate variant (TGL1)

The Tiger Hills series coarse-loamy (L, SIL, VFSL) substrate variant, occurs in close association with Tiger Hills soils and differs from them in having light yellowish brown, relatively stone-free, coarse loamy substrate material within a meter of the mineral surface.

Trinton Series (TNT)

The Trinton series consists of well drained Orthic Dark Gray Luvisol soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, coarse loamy (L, SIL, VFSL), lacustrine deposits over moderately to strongly calcareous, deep, stratified sandy-skeletal (GrS, GrLS), glaciofluvial deposits. These soils occur in upper slope positions of very gentle slopes on hummocky landscapes and have moderate permeability moderate surface runoff and a low water table during the growing season. Trinton soils have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Trinton soil the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ap or Ah horizon, 15 to 20 cm thick, a light gray Ae or Ahe horizon, 5 to 15 cm thick with thin platy structure, a dark brown Bt horizon 10 to 20 cm thick, a dark brown transitional IIBC, 5 to 10 cm thick and a light brown IICk horizon. The parent material is typically stratified with thin layers of SiL, L and VFSL in the gravelly deposits.

Trinton soils occur in close association with Vandal, Vartel and Carvey soils. They are similar to Vandal soils by having well drained profiles developed in sandy-skeletal glacio-fluvial deposits but differ from Vandal soils by having an Ae horizon at least 5 cm thick. Trinton soils were previously mapped as an associate of the Leary association and as minor inclusions in the Pembina association, in the reconnaissance soil survey of South-Central Manitoba (1943).

Ullrich Series (ULH)

The Ullrich series consists of imperfectly drained Gleyed Black soil developed on a mantle (25 to 100cm) of moderately to strongly calcareous, uniform, fine loamy (L, CL, SICL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (L, CL), mixed till deposits. These soils occur in middle to lower slope positions of very gentle slopes on undulating landscapes and have moderate permeability moderately slow surface runoff and a medium water table during the growing season. Ullrich soils have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed by aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Ullrich soil the solum is approximately 35 cm thick. The profile is characterized by black to very dark gray Ap or Ah horizon, 10 to 20 cm thick, a very dark brown Bm horizon, 10 to 20 cm thick with fine, faint iron mottles, a transitional dark brown IIBC horizon, 5 to 10 cm thick and a grayish brown IICk horizon with common distinct, iron mottles.

Ullrich soils occur in close association with Knudson, Joyale and Guerra soils. They are similar to Nikkel soils by having an imperfectly drained Gleyed Black profile and a fine loamy till substrate. However, they differ from Nikkel soils in having a loamy textured lacustrine mantle overlying glacial till. Ullrich soils were previously mapped as imperfectly drained associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Vandal Series (VDL)

The Vandal series consists of well drained Orthic Dark Gray soil developed on a mantle (30 to 100cm) of moderately to strongly calcareous, thin stratified, coarse-loamy (SiL, L, SL), lacustrine deposits over moderately to strongly calcareous, deep, stratified, sandy skeletal (GrS, LGrS) glaciofluvial deposits. These soils occur in middle and upper positions of very gentle to moderate slopes on hummocky landscapes and have moderate over rapid permeability moderate surface runoff and a low water table during the growing season. Vandal soils have low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses aspen popular and scrub oak. The majority of these soils are currently used for mixed farming but where gravel deposits are sufficiently deep they have been mined as a source for gravel.

In a representative profile of Vandal soil the solum is approximately 45 cm thick. The profile is characterized by a very dark grayish brown Ap or Ah horizon, 10 to 18 cm thick, a grayish brown Bt or Btj horizon, 20 to 35 cm thick, a yellowish brown IICca horizon, 10 to 20 cm thick with numerous coarse fragments and a brown to light brown IICk horizon with mixed shale, limestone and granite gravel. The parent material is typically stratified with very gravelly and coarse sand layers (8 to 10 cm). A typical profile also contains thin (<2 cm) lenses of silt loam to very fine sandy loam at depth.

Vandal soils occur in close association with Firdale, Vartel and Carvey soils. They are similar to Altamont soils by having an Orthic Dark Gray profile developed mostly in loamy and fine silty deposits but differ from them in having a sandy and gravelly substrate rather than a fine loamy glacial till substrate. Vandal soils were previously mapped as a dominant associate of the Indian Springs complex in the reconnaissance soil survey of South-Central Manitoba (1943).

An example profile of a Vandal soil is presented in Appendix F.

Vandal Series, shale gravel substrate variant (VDL1)

The Vandal series shale gravel substrate variant, occurs in close association with Vandal soils and differ from them in having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

Vandal Series, sandy substrate variant (VDL2)

The Vandal series sandy substrate (LS, LFS) variant, occurs in close association with Vandal soils and differs from them in having a sandy substrate rather than a sandy skeletal substrate found in normal Vandal soils.

Vartel Series (VTL)

The Vartel series consists of imperfectly drained Gleyed Dark Gray soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, coarse-loamy (SIL, L, SL), lacustrine deposits over moderately to strongly calcareous, stratified, deep sandy-skeletal (GrS, LGrS), glaciofluvial deposits. These soils occur in lower slope positions of very gentle to moderate slopes on hummocky landscapes and have moderate over rapid permeability, moderately slow surface runoff and a medium water table during the growing season. Vartel soils are non-eroded, non-stony and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Vartel soil the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ap or Ah horizon, 10 to 20 cm thick, a brown to olive brown Bt or Btj horizon, 15 to 30 cm thick with many, fine, faint iron mottles, an olive brown IIBC horizon, 5 to 15 cm thick with faint iron mottles and a dark yellowish brown IICk horizon with large, distinct iron mottles. The parent material is typically mixed gravel of limestone, granite and shale origin. A typical profile also contains thin strata of L, VFSL and SiL interspersed with gravelly layers.

Vartel soils occur in close association with Vandal and Carvey soils. They are similar to Tellier soils by having a Gleyed Dark Gray profile developed in fine loamy lacustrine deposits but differ from them in having a sandy-skeletal glaciofluvial substrate rather than a fine loamy glacial till substrate. Vartel soils were previously mapped as imperfectly drained associates of the Leary association and Indian Springs complex in the reconnaissance soil survey of South-Central Manitoba (1943).

Vartel Series, shale gravel substrate variant (VTL1)

The Vartel series shale gravel substrate variant, occurs in close association with typical Vartel soils and differs in having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

Xavier Series (XVI)

The Xavier series consists of very poorly to poorly drained Typic Mesisol soil developed on medium acid to neutral, mesic fen peat deposits. These soils occur in depressional to level positions of moderate slopes on hummocky landscapes and have rapid permeability, very slow surface runoff and ponded water during the growing season. Xavier soils have high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation often includes sedges, rushes, willows and swamp birches. The majority of these soils are currently in their natural state.

In a representative profile of Xavier soil the solum is approximately 160 cm thick. The profile is characterized by a dark yellowish brown Om horizon, 10 to 30 cm thick, composed of fibric fen peat, a very dark brown Om horizon, 30 to 60 cm thick, composed of mesic fen peat and a black, slightly acid to slightly calcareous, Oh horizon composed of humic fen peat. The organic deposits typically overlay mineral soils at depths in excess of 160 cm. A typical profile also contains fractured shells in the surface layer.

Xavier soils are similar to Perillo soils by being poorly drained organic soils but differ from them in having significantly deeper (>160 cm) organic surface deposits over mineral substrata. Xavier soils correlate with deep (>160 cm), poorly drained organic deposits designated as meadow or marsh phases of various soil associations in the reconnaissance soil survey of South-Central Manitoba (1943).

Zaplin Series (ZPI)

The Zaplin series consists of imperfectly drained Gleyed Dark Gray soil developed on moderately to strongly calcareous, deep, uniform, fine loamy (L, CL, SICL), till sediments of mixed limestone, granite and shale origin. These soils occur in lower slope positions of gentle slopes on hummocky landscapes and have moderate permeability moderately slow surface runoff and a medium water table during the growing season. Zaplin soils are non-eroded, slightly stony and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Zaplin soil the solum is approximately 45 cm thick. The profile is characterized by a dark gray Ap or Ah horizon, 10 to 20 cm thick, a very dark brown Bt or Btj horizon, 20 to 30 cm thick with a few, fine, faint mottles, a grayish brown transitional BC horizon, 10 to 15 cm thick and a dark yellowish brown Ck horizon with many fine, distinct mottles.

Zaplin soils occur in close association with Dezwood and Horose soils. They are similar to Tellier soils by having a Gleyed, Dark Gray profile and a fine-loamy till substrate. However, they differ from Tellier soils in not having up to 100 cm of fine loamy lacustrine material overlying loamy glacial till. Zapline soils were previously mapped as imperfectly drained minor associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

PART 4

USE AND MANAGEMENT INTERPRETATIONS OF SOILS

4.1 INTRODUCTION

This section provides predictions of performance or soil suitability ratings for various uses of soils based on field observations of soil and landscape characteristics, laboratory data and on observations of soil behavior under specified conditions of land use and management. Suitability ratings or interpretations are intended only to serve as guides for planners and managers. Caution, with an understanding of the limitations of the soil map must be exercised when applying suitability ratings to soil map units. The value of any rating or interpretation depends upon the nature and composition of individual map unit delineation which in turn depends on the scale of mapping and intensity of ground truthing employed in the survey.

In this section, interpretive soil information is provided for the following land use evaluations:

1. Agriculture
    a) dryland farming capability
    b) irrigation suitability
2. Engineering Uses
3. Recreation Uses

4.2 SOIL CAPABILITY FOR AGRICULTURE

Dryland Agriculture

Soil capability classification for dryland agriculture is based on an evaluation of both internal and external soil characteristics that influence soil suitability and limitations for agricultural use. In this classification, mineral soils are grouped into capability classes, subclasses and units based on their limitations for dryland farming, risk of damage when the soils are used and the way they respond to management[1]. There are seven capability classes, each of which groups soils together that have the same relative degree of limitation or hazard for agricultural use. The limitation becomes progressively greater from Class 1 to Class 7. The class indicates the general suitability of the soils for agriculture. The first three classes are considered capable of sustained production of common field crops, the fourth is marginal for sustained arable culture, the fifth is suitable only for improved permanent pasture, the sixth is capable of use only for native pasture while the seventh class is for soils and land types considered incapable of use for arable agriculture or permanent pasture.

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[1] Anon. 1965. Land capability classification for agriculture Report No. 2, Canada Land Inventory, Canada Dept. Regional Economic Expansion, Ottawa. 16 pp.

Organic soils within the map area are rated for "potential" agricultural capability after the method of Leeson[2]. Capability ratings of organic soils for agriculture must recognize that most organic soils have little or no value for agriculture in their native state and their potential is only achieved through reclamation or development implemented with varying degrees of difficulty. Capability class definitions for organic soils are the same as for mineral soils. They are however, identified on maps and tables with the prefix "O".

Soil Capability subclasses are divisions within classes which group soils with similar kinds of limitations and hazards for agricultural use. The various kinds of limitations recognized at the subclass level are defined in Table 5.

A summary of the soils in the Rural Municipality of Lorne showing their major characteristics and their interpretive classification for dryland agriculture is presented in Table 6.

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[2] Leeson, Bruce et al. 1969. An organic soil capability classification for agriculture and a study of the organic soils of Simcoe County, Soil Sci. Dept., Ontario Agricultural College, Guelph, Ontario.

TABLE 5

Agricultural Capability Subclass Limitations

C -	Adverse climate: This subclass denotes a significant adverse climate for crop production as compared to the "median" climate which is defined as one with sufficiently high growing season temperatures to bring field crops to maturity, and with sufficient precipitation to permit crops to be grown each year on the same land without a serious risk of partial or total crop failures.
D -	Undesirable soil structure and/or low permeability: This subclass is used for soils difficult to till, or which absorb water very slowly or in which the depth of rooting zone is restricted by conditions other than a high water table or consolidated bedrock.
E -	Erosion: Subclass E includes soils where damage from erosion is a limitation to agricultural use. Damage is assessed on the loss of productivity and on the difficulties in farming land with gullies.
F -	Low fertility: This subclass is made up of soils having low fertility that either is correctable with careful management in the use of fertilizers and soil amendments or is difficult to correct in a feasible way. The limitation may be due to lack of available plant nutrients, high acidity or alkalinity, low exchange capacity, high levels of carbonates or presence of toxic compounds.
I -	Inundation by streams or lakes: This subclass includes soils subjected to inundation causing crop damage or restricting agricultural use.
L -	Coarse wood fragments: In the rating of organic soils, woody inclusions in the form of trunks, stumps and branches (>10 cm diameter) in sufficient quantity to significantly hinder tillage, planting and harvesting operations.
M -	Moisture limitation: This subclass consists of soils where crops are adversely affected by droughtiness owing to inherent soil characteristics. They are usually soils with low water-holding capacity.
N -	Salinity: Designates soils which are adversely affected by the presence of soluble salts.
P -	Stoniness: This subclass is made up of soils sufficiently stony to significantly hinder tillage, planting, and harvesting operations. Stony soils are usually less productive than comparable non-stony soils.
R -	Consolidated bedrock: This subclass includes soils where the presence of bedrock near the surface restricts their agricultural use. Consolidated bedrock at depths greater than 1 meter from the surface is not considered as a limitation, except on irrigated lands where a greater depth of soil is desirable.

T - Topography: This subclass is made up of soils where topography is a limitation. Both the percent of slope and the pattern or frequency of slopes in different directions are important factors in increasing the cost of farming over that of smooth land, in decreasing the uniformity of growth and maturity of crops, and in increasing the hazard of water erosion.

W - Excess water: Subclass W is made up of soils where excess water other than that brought about by inundation is a limitation to their use for agriculture. Excess water may result from inadequate soil drainage, a high water table, seepage or runoff from surrounding areas.

X - Cumulative minor adverse characteristics: This subclass is made up of soils having a moderate limitation caused by the cumulative effect of two or more adverse characteristics which singly are not serious enough to affect the class rating.

Irrigation Suitability

Irrigation suitability of soils is determined by evaluating the nature of both internal and external soil characteristics[3]. The classification of soils for irrigation suitability consists of three categories: class, subclass and unit.

The suitability class groups soils having the same relative suitability or degree of limitation or hazard for irrigation use. Four classes are utilized grading from Class 1, which is very good to Class 4, which is poor. The four classes are:

Class 1 - Very good: These are soils of fine sandy loam to clay loam texture which are well suited for irrigation use. The soils have good water retention capacity, good permeability, low salt content, good drainage and low general gradient of land surface.

Class 2 - Good: These are soils of loamy fine sand to light clay texture which are moderately well suited for irrigation use. Slight limitation to use results from soil factors such as water holding capacity, permeability, depth of material, salt content, topographic factors such as slope and pattern or drainage restrictions arising from surface drainage and depth to water table.

Class 3 - Fair: These are coarse or fine textured soils which are fair to marginally suitable because of some unfavorable characteristics that limit production and cause management problems under irrigation use. Soil, topographic or drainage factors are more restrictive than in Class 2.

Class 4 - Poor: These are soils that are considered poor to unsuitable for irrigation use because of severe drainage problems, impermeable geologic material, salinity, very low water holding capacity, very rapid permeability, topography or a combination of these problems.

The suitability subclass identifies soils with similar kinds of limitations and hazards related to both internal and external soil characteristics. The internal characteristics include both permanent and non-permanent properties; the permanent properties are those that will not change over time whereas the non-permanent properties may be altered with time by specific management. The properties which affect irrigation suitability of soil are listed as follows:

1. Internal Characteristics
    - a) Permanent - Texture, uniformity and depth of geologic deposit, hydraulic conductivity and water storage capacity
    - b) Non-permanent - Structure, drainage, fertility, reaction, salinity, exchangeable sodium

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[3] PFRA. 1964. Handbook for the classification of irrigation land in the prairie provinces. Prepared by Committee of the Canada Dept. of Agriculture. PFRA, Regina, Sask. 92 pp.

2. External Characteristics

a) Topography, erosion, stoniness, vegetative cover

The classification criteria for irrigation suitability are summarized in Table 11, Appendix D. The soils of the Rural Municipality of Lorne are evaluated for irrigation suitability in Table 6.

TABLE 6

Agricultural Classification and Irrigation Suitability of Soils in the Rural Municipality of Lorne

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
ATN	Altamont	1	3S
ATN /xcxx	Altamont	2T	3S
ATN /lclx	Altamont	2T	3S
ATN /xdxx	Altamont	3T	3ST
BWO	Barwood	2W	3D
CAV	Carvey	4W	4D
CKD /xxxs	Crookdale	3N	3S
CKD /3xxx	Crookdale	3E	3S
CXT	Capell	2W	2SD
CXV	Charman	2W	2D
CYN /xcxx	Croyon	3M	2ST
CYN /xdxx	Croyon	3MT	3T
CYN /xfxx	Croyon	5T	4T
CYN /3fxx	Croyon	5T	4T
CYN1/2exx	Croyon	4E	4T
CZK	Cazlake	5W	4DS
CZKp	Cazlake	5W	4D
DGF	Darlingford	2X	3S
DGF /xcxx	Darlingford	2T	3S
DGF /xe2x	Darlingford	4T	4T
DLN	Danlin	2W	2SD
DLN /xcxx	Danlin	2WT	2SD
DXM	Druxman	2W	2SD
DZW	Dezwood	2X	3S
DZW /xxlx	Dezwood	2X	3S
DZW /lxlx	Dezwood	2X	3S
DZW /xcxx	Dezwood	2T	3S
DZW /xclx	Dezwood	2T	3S
DZW /lcxx	Dezwood	2T	3S
DZW /lclx	Dezwood	2T	3S
DZW /xdxx	Dezwood	3T	3ST
DZW /ldxx	Dezwood	3T	3TS
DZW /2dlx	Dezwood	3T	3TS
DZW /xd2x	Dezwood	3TP	3TS
DZW /3dlx	Dezwood	4E	3ST
DZW /2dxx	Dezwood	3T	3ST
DZW /ldlx	Dezwood	3T	3TS
DZW /xdlx	Dezwood	3T	3TS
DZW /xexx	Dezwood	4T	4T
DZW /lexx	Dezwood	4T	4T

TABLE 6

Agricultural Classification and Irrigation Suitability of Soils in the Rural Municipality of Lorne

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
DZW /xe1x	Dezwood	4T	4T
DZW /1e1x	Dezwood	4T	4T
DZW /2exx	Dezwood	4T	4T
DZW /2e1x	Dezwood	4T	4T
DZW /3f1x	Dezwood	5TE	4T
DZW /3f2x	Dezwood	5TE	4T
FFR	Fifere	2X	3S
FFR /xcxx	Fifere	2T	3S
FFR /1cxx	Fifere	2X	3S
FFR /1c1x	Fifere	2T	3S
FFR /xdxx	Fifere	3T	3T
FFR /1dxx	Fifere	3T	3TS
FFR /1d1x	Fifere	3T	3TS
FFR /xexx	Fifere	4T	4T
FFR /1exx	Fifere	4T	4T
FFR /2exx	Fifere	4T	4T
FFR /2e1x	Fifere	4T	4T
FFR /xfxx	Fifere	5T	4T
FIR	Firdale	1	1
FIR /xcxx	Firdale	2T	2T
FIR /1cxx	Firdale	2T	2T
FIR /3cxx	Firdale	3E	2T
FIR /xdxx	Firdale	3T	3T
FIR /1dxx	Firdale	3T	3T
FIR /2dxx	Firdale	3TE	3T
FIR /xexx	Firdale	4T	4T
FIR /1exx	Firdale	4T	4T
FIR /2exx	Firdale	4TE	4T
FIR /3exx	Firdale	5E	4T
FIR /2fxx	Firdale	5TE	4T
FIR /3fxx	Firdale	5TE	4T
FRS	Ferris	2W	3D
FSO	Fresno	2W	3D
FSO /xcxx	Fresno	2WT	3D
GRR	Guerra	4W	4D
GRRp	Guerra	5W	4D
GRR /xxxs	Guerra	4W	4D
GRRp/xxxs	Guerra	5W	4D
HIT /xcxx	Hilton	2T	3S
HIT /1cxx	Hilton	2T	3S

TABLE 6

Agricultural Classification and Irrigation Suitability of Soils in the Rural Municipality of Lorne

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
HIT /xc1x	Hilton	2T	3S
HIT /xc2x	Hilton	2T	3S
HIT /1c1x	Hilton	2T	3S
HIT /2c1x	Hilton	2T	3S
HIT /2c2x	Hilton	2T	3S
HIT /xdxx	Hilton	3T	3ST
HIT /1dxx	Hilton	3T	3ST
HIT /xd1x	Hilton	3T	3ST
HIT /1d1x	Hilton	3T	3ST
HIT /xd2x	Hilton	3T	3ST
HIT /2d1x	Hilton	3TE	3ST
HIT /2d2x	Hilton	3T	3ST
HIT /3d2x	Hilton	4E	3ST
HIT /xe1x	Hilton	4T	4T
HIT /1e1x	Hilton	4T	4T
HIT /1e2x	Hilton	4T	4T
HIT /2e2x	Hilton	4TE	4T
HIT /2e1x	Hilton	4TE	4T
HIT /2e3x	Hilton	4TP	4T
HIT /3e1x	Hilton	5E	4T
HIT /3e2x	Hilton	5E	4T
HIT /2fxx	Hilton	5T	4T
HIT /2f1x	Hilton	5T	4T
HIT /2f2x	Hilton	5T	4T
HIT /3f1x	Hilton	5TE	4T
HKS	Hickson	5W	4D
HKS /xxxs	Hickson	5W	4D
HKSp	Hickson	5W	4D
HKSp/xxxs	Hickson	5W	4D
HOS	Horose	5W	4D
JYL	Joyale	2W	3D
JYL /xxxs	Joyale	3N	3SD
JYL /xx1x	Joyale	2W	3D
JYL /xcxx	Joyale	2TW	3SD
KIS	Kingsley	1	3S
KIS /xcxx	Kingsley	2T	3S
KIS /1cxx	Kingsley	2T	3S
KUD	Knudson	1	3S
KUD /xcxx	Knudson	2T	3S
KUD /ocxx	Knudson	2T	3S

TABLE 6

Agricultural Classification and Irrigation Suitability of Soils in the Rural Municipality of Lorne

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
KUD /xc1x	Knudson	2T	3S
KUD /xdxx	Knudson	3T	3ST
LEI	Levine	3I	3D
LRY	Leary	5M	4S
LRY /xcxx	Leary	5M	4S
LRY /1c1x	Leary	5M	4S
LRY /1d1x	Leary	5M	4ST
LRY /2d2x	Leary	5M	4ST
LRY /xexx	Leary	5M	4ST
LRY /1exx	Leary	5M	4ST
LRY /xe1x	Leary	5M	4ST
LRY /1e1x	Leary	5M	4ST
LRY /2exx	Leary	5M	4ST
LRY /3exx	Leary	5ME	4ST
LRY /xfxx	Leary	5MT	4ST
LRY /1fxx	Leary	5MT	4ST
LRY /2fxx	Leary	5MT	4ST
LRY /3fxx	Leary	5MT	4ST
LRY1	Leary	5M	4S
LRY1/xdxx	Leary	5M	4S
LRY1/xfxx	Leary	5MT	4ST
MXS /xcxx	Manitou	2T	3S
MXS /xdxx	Manitou	3T	3S
NKK	Nikkel	2W	3D
NKK /xx1x	Nikkel	2W	3D
NSH	Narish	4W	4D
NYO /xcxx	Nayler	2T	4S
NYO /xdxx	Nayler	3T	4S
NYO /1dxx	Nayler	3T	4S
NYO /1d1x	Nayler	3T	4S
NYO /xexx	Nayler	4T	4ST
NYO /1exx	Nayler	4T	4ST
NYO /1e1x	Nayler	4T	4ST
NYO /2exx	Nayler	4TE	4ST
NYO /2e1x	Nayler	4TE	4ST
NYO /3exx	Nayler	5E	4ST
NYO /xfxx	Nayler	5T	4ST
NYO /1fxx	Nayler	5T	4ST
NYO /1f1x	Nayler	5T	4ST
NYO /2fxx	Nayler	5T	4ST

TABLE 6

Agricultural Classification and Irrigation Suitability of Soils in the Rural Municipality of Lorne

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
NYO /2f1x	Nayler	5T	4ST
NYO /2f2x	Nayler	5T	4ST
OIV /xxxs	Oliver	3N	3S
PBI	Pembina	2X	3S
PBI /xcxx	Pembina	2T	3S
PBI /1cxx	Pembina	2T	3S
PBI /1c1x	Pembina	2T	3S
PBI /1c2x	Pembina	2T	3S
PBI /2c1x	Pembina	3E	3S
PBI /xdxx	Pembina	3T	3ST
PBI /1dxx	Pembina	3T	3ST
PBI /1d1x	Pembina	3T	3ST
PBI /xd1x	Pembina	3T	3ST
PBI /1d2x	Pembina	3T	3ST
PBI /2d1x	Pembina	3TE	3ST
PBI /2e1x	Pembina	4TE	4T
PBI /xexx	Pembina	4T	4T
PBI /1exx	Pembina	4T	4T
PBI /1e1x	Pembina	4T	4T
PBI /2exx	Pembina	4TE	4T
PBI /1fxx	Pembina	5T	4T
PBI /2f1x	Pembina	5T	4T
PBI /3fxx	Pembina	5TE	4T
PBI /3f1x	Pembina	5TE	4T
PBI1/1c1x	Pembina	2T	3S
PBI1/xdxx	Pembina	3T	3ST
PBI1/xd1x	Pembina	3T	3ST
PBI1/1dxx	Pembina	3T	3ST
PBI1/1e1x	Pembina	4T	4T
PBI1/2e1x	Pembina	4TE	4T
PBI1/2exx	Pembina	4TE	4T
PBI1/xfxx	Pembina	5T	4T
PBI1/2fxx	Pembina	5T	4T
PBI2/1d1x	Pembina	3T	3ST
PDA	Prodan	2W	2D
PDA /xxxs	Prodan	3N	3S
PDA /xcxx	Prodan	2WT	2T
PER	Perillo	03W	4D
PYR /xcxx	Poyser	2T	3S
PYR /1c1x	Poyser	2T	3S

TABLE 6

Agricultural Classification and Irrigation Suitability of Soils in the Rural Municipality of Lorne

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
PYR /xd1x	Poyser	3T	3ST
PYR /1d1x	Poyser	3T	3ST
PYR /2e1x	Poyser	4TE	4T
PYR1/1exx	Poyser	4T	4T
PYR1/1fxx	Poyser	5T	4T
PYR1/2fxx	Poyser	5T	4T
PYR2/xcxx	Poyser	2TS	3S
PYR2/1cxx	Poyser	2TS	3S
PYR2/1c1x	Poyser	2TS	3S
PYR2/xdxx	Poyser	3T	3ST
PYR2/1dxx	Poyser	3T	3ST
PYR2/1d1x	Poyser	3T	3ST
PYR2/2d1x	Poyser	3TE	3ST
PYR2/1e2x	Poyser	4T	4T
RAM	Ramada	1	1
RAM /xcxx	Ramada	2T	2T
RAM /1cxx	Ramada	2T	2T
RAM /xdxx	Ramada	3T	3T
TDP	Tadpole	4W	4D
TDPp	Tadpole	4W	4D
TDP /xxxs	Tadpole	4W	4D
TDP /xxxu	Tadpole	6WN	4D
TGL /xcxx	Tiger Hills	2T	4DS
TGL /1c1x	Tiger Hills	2T	3S
TGL /xc1x	Tiger Hills	2T	3S
TGL /2cxx	Tiger Hills	2TE	3S
TGL /2c1x	Tiger Hills	2TE	3S
TGL /3c2x	Tiger Hills	3E	3S
TGL /xdxx	Tiger Hills	3T	3ST
TGL /xd3x	Tiger Hills	3TP	3ST
TGL /1d1x	Tiger Hills	3T	3ST
TGL /1e1x	Tiger Hills	4T	4T
TGL /1e2x	Tiger Hills	4T	4T
TGL /1e3x	Tiger Hills	4T	4T
TGL /2exx	Tiger Hills	4TE	4T
TGL /2e1x	Tiger Hills	4TE	4T
TGL /2e2x	Tiger Hills	4TE	4T
TGL /xfxx	Tiger Hills	5T	4T
TGL /1fxx	Tiger Hills	5T	4T
TGL /2f1x	Tiger Hills	5T	4T

TABLE 6

Agricultural Classification and Irrigation Suitability of Soils in the Rural Municipality of Lorne

Map Symbol and Phase	Soil Name	Agricultural Capability Class	Irrigation Suitability
TGL /2f2x	Tiger Hills	5T	4T
TGL /3f2x	Tiger Hills	5TE	4T
TGL /3f3x	Tiger Hills	5T	4T
TGL1/xdxx	Tiger Hills	3T	3ST
TGL1/3d1x	Tiger Hills	4E	3ST
TGL1/xexx	Tiger Hills	4T	4T
TGL1/2f1x	Tiger Hills	5T	4T
TLI	Tellier	2W	3D
TLI /xc1x	Tellier	2T	3SD
TNT	Trinton	1	3S
TNT /xcxx	Trinton	2T	3S
TNT /1c1x	Trinton	2T	3S
ULH	Ullrich	2W	3D
VDL	Vandal	2M	2S
VDL /xcxx	Vandal	2TM	2ST
VDL /xc1x	Vandal	2TM	2ST
VDL /xdxx	Vandal	3T	3T
VDL /1dxx	Vandal	3T	3T
VDL /xexx	Vandal	4T	4T
VDL /1exx	Vandal	4T	4T
VDL /xe1x	Vandal	4T	4T
VDL /2exx	Vandal	4TE	4T
VDL /3exx	Vandal	5E	4T
VDL /2fxx	Vandal	5T	4T
VDL /3fxx	Vandal	5TE	4T
VDL1	Vandal	2M	2S
VDL1/xcxx	Vandal	2MT	2TS
VDL1/1cxx	Vandal	2MT	2ST
VDL1/1dxx	Vandal	3T	3T
VDL1/1exx	Vandal	4T	4T
VDL1/2exx	Vandal	4TE	4T
VDL1/1fxx	Vandal	5T	4T
VDL2/xcxx	Vandal	2MT	2ST
VDL2/1dxx	Vandal	3T	3T
VDL2/2dxx	Vandal	3TE	3T
VDL2/2exx	Vandal	4TE	4T
VTL	Vartel	2W	2SD
VTL1	Vartel	2W	2SD
XVI	Xavier	03W	4D
ZPI	Zaplin	2W	3DS

4.3 SOIL SUITABILITY FOR SELECTED ENGINEERING USES

This section provides information which can be used by engineers and land use planners concerned with engineering and related geotechnical aspects of soil. It is intended to supplement the information on the soil map with additional data on engineering properties of soils.

The criteria used to evaluate soil suitability for selected engineering and related recreational uses are adopted from quides found in[4],

Definition of Soil Suitability Classes

Evaluation of soil suitability for engineering and recreation uses is based on both internal and external soil characteristics. Four soil suitability classes are used to evaluate both mineral and organic soils and hence, mapping units for selected uses. These ratings express relative degrees of suitability or limitation for potential uses of natural or essentially undisturbed soils. The long term effects of the potential use on the behavior of the soil are considered in the rating.

The four suitability class ratings are defined as follows:

Good -	Soils in their present state have few or minor limitations that would affect the proposed use. The limitations would easily be overcome with minimal cost.
Fair -	Soils in their present state have one or more moderate limitations that would affect the proposed use. These moderate limitations would be overcome with special construction, design, planning or maintenance.
Poor -	Soils in their present state have one or more severe limitations that would severely affect the proposed use. To overcome these severe limitations would require the removal of the limitation or difficult and costly alteration of the soil or of special design or intensive maintenance.
Very Poor -	Soils have one or more features so unfavorable for the proposed use that the limitation is very difficult and expensive to overcome or the soil would require such extreme alteration that the proposed use is economically impractical.

Soil Suitability Subclasses

The basic soil properties that singly or in combination with others commonly affect soil suitability for selected engineering properties and recreation uses are provided in Table 7. These subclass designations serve to identify the kind of limitation or hazard for a particular use.

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[4] Coen et al. (1977), and from guides developed by the Soil Conservation Service, USDA (1971), and the Canada Soil Survey Committee (1973).

Guides for Assessing Soil Suitability

Guides for assessing soil suitability for ten engineering related uses are given in Appendix D, Tables 12 to 21. These tables provide as specifically as possible, definitions of the soil properties which result in the specific suitability or degree of limitation. In assessing soil suitability for various engineering uses, the degree of suitability is determined by the most restrictive or severe rating assigned to any one of the listed soil properties. For example, if the suitability is "Good" for all but one soil property and it is estimated to be "Very Poor", then the overall rating of the soil for that selected use is "Very Poor". Suitability of individual soil properties, if estimated to be "Fair" or "Poor", can be accumulative in their effect for a particular use. Judgement is required to determine whether the severity of the combined effects of several soil properties on suitability for a particular use will result in downgrading an evaluation. This is left to the discretion of the interpreter. It is incorrect to assume that each of the major soil properties influencing a particular use has an equal effect. Class limits established for rating the suitability of individual soil properties take this into account. For a selected use, therefore, only those soil properties which most severely limit that use are specified.

Engineering description and estimated engineering properties for selected soils are provided in Table 8. These data, in addition to information contained in other sections of the report have been used to rate the soils according to their suitability for ten selected engineering uses in Table 9. When using these interpretations, consideration must be given to the following assumptions:

1. Interpretations are based on predictions of soil behavior under defined conditions of use and management as specified in the preamble to each of Tables 12 through 21 (Appendix D).

2. Soil ratings do not include site factors such as nearness to towns and highways, water supply, aesthetic values, etc.

3. Soil ratings are based on natural, undisturbed soil.

4. Soil suitability ratings are usually given for the entire soil, but for some uses, they may be based on the limitations of an individual soil horizon or other earthy layer, because of its overriding importance. Ratings rarely apply to soil depths greater than 1 to 2 meters, but in some kinds of soils, reasonable estimates can be given for soil material at greater depths. It should be noted here that the term "soil" has been used throughout the report in the pedologic sense and differs in concept from that commonly used by engineers.

5. Poor and very poor soil ratings do not imply that a site cannot be changed to remove, correct or modify the soil limitations. The use of soils rated as poor depends on the nature of the limitations, whether or not the soil limitation can be altered successfully and economically, and on the scarcity of good sites.

6. Interpretations of map units do not eliminate the need for on-site evaluation by qualified professionals. Due to the variable nature of soils,

and the scale of mapping, small, unmappable inclusions of soils with different properties may be present in an area where a development is planned. The need for or importance of on-site studies depends on the use to be made of the soil and the kinds of soil and soil problems involved.

4.4 SOIL SUITABILITY FOR SELECTED RECREATION USES

This section provides interpretations of the soil suitability for recreational development. All types of soil can be used for recreational activities of some kind.

Soils and their properties determine to a large degree, the type and location of recreational facilities. Wet soils are not suitable for campsites, roads, playgrounds or picnic areas. Soils that pond and dry out slowly after heavy rains present problems where intensive use is contemplated. It is difficult to maintain grass cover for playing fields and golf courses on droughty soils. The feasibility of many kinds of outdoor activities are determined by other basic soil properties such as depth to bedrock, stoniness, topography or land pattern, and the ability of the soil to support vegetation of different kinds as related to its natural fertility.

The suitability of the various soil series and phases for selected recreation uses is shown in Table 10 according to four classes, Good, Fair, Poor and Very poor defined previously in the section on Engineering Uses. Subclasses are employed to identify the kind of limitation or hazard for a particular use. An explanation of subclass symbols are provided in Table 7.

The guidelines for various recreation uses are presented in Appendix D, Tables 22 to 25.

TABLE 7

Codes utilized to identify limitations in evaluating soil suitability for selected Engineering and Recreational Uses(Tables 12 and 25)

a	subgrade properties
b	thickness of topsoil
c	coarse fragments on surface
d	depth to bedrock
e	erosion or erodibility
f	susceptibility to frost hazard
g	contamination hazard of groundwater
h	depth to seasonal water table
i	flooding or inundation
j	thickness of slowly permeable material
k	permeability or hydraulic conductivity
l	shrink-swell properties
m	moisture limitations or deficit
n	salinity or sulphate hazard
o	organic matter
p	stoniness
q	depth to sand or gravel
r	rockiness
s	surface texture
t	topographic slope class
u	moist consistence
w	wetness or soil drainage class
z	permafrost

TABLE 8

Engineering Description of the Soils and Their Estimated Properties

Significant to Engineering

Map Symbol	Soil Series	Depth (cm)	Classification			% Passing			Permea-bility* cm/hr	Reaction	Sulfate hazard**	Shrink-Swell	Depth to water table (m)
			USDA	Unified	AASHO	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (.074 mm)					
ATN	Altamont	0-40	CL	CL	A-6	100	100	75-85	1.5-2.5	6.8-7.2	low	mod.	1.5
		40-70	L-SiCL	ML or CL	A-4,A-6	85-95	75-85	60-75	0.5-2.0	7.0-7.6	low	mod.	
		70-100+	L-CL	CL	A-4,A-6	85-95	55-75	40-60	.2	7.2-7.8	low	mod.	
BWO	Barwood	0-20	L-CL	CL	A-6,A-7-5	85-95	80-95	60-75	1.5-5.0	7.6-8.0	low	mod.	seasonal
		20-60	L-SiCL	CL to ML	A-4	85-95	80-90	60-75	0.5-1.5	8.0-8.4	mod.	mod.	0.7
		60-100	L-CL	SC to CL	A-6,A-4	85-95	75-90	40-65	.25	8.0-8.4	mod.	mod.	
CAV	Carvey	0-25	SCL-L	SC or CL	A-4,A-6	100	80-95	40-75	-	7.8-8.2	low-mod.	mod.	seasonal at or near surface
		25-50	SL-L	SM or CL	A-4,A-6	100	60-95	35-75	-	7.8-8.4	low-mod.	mod.	
		50-100	CS-GrS	SP or GW	A-1	var.	60	5	-	7.8-8.4	low-mod.	low	
CKD	Crookdale	0-25	SCL-CL	CL	A-6	100	100	60-80	1.5-5	7.0-7.4		low-mod.	seasonal
		25-75	SCL-CL	CL	A-6	100	100	60-80	1.5-5	7.4-7.8		low-mod.	0.8
		75-100+	FS-LVFS	SM,SP,ML	A-2 to A-4	100	100	5-50	6-13	7.6-8.0		low-low	
CXT	Capell	0-20	SCL-L	CL	A-6,A-7-5	95-100	85-95	40-55	1.5-5.0	7.6-8.0	low-mod.	mod.	0.8
		20-40	SCL-L	SC or CL	A-6,A-4	95-100	85-95	30-50	1.5-5.0	7.8-8.2	low-mod.	mod.	
		40-70	Gr-SL	SM	A-1,A-2	-	50	15-30	25.0-50.0	7.8-8.2	low-mod.	low	
		70+	GrS	SP or GP	A-1	-	45	5	50.0	7.8-8.2	low-mod.	low	
CXV	Charman	0-20	CL	CL	A-7-6	100	100	90-100	1.5	7.4-7.8	low	mod.	
		20-80	SiCL	CL	A-7-6	100	100	90-100	1.5	7.8-8.2	low	mod.	1.2
		80-100	SiL-SiCL	CL	A-6,A-7-6	100	100	90-100	0.1-5.0	7.8-8.4	low	mod.	
CYN	Croyon	0-25	SCL-L	CL	A-6	100	85-95	40-75	1.5-5.0	7.2-7.6	low	mod.	2
		25-50	SL-L	CL or SM	A-4,A-6	90-100	60-95	35-75	1.5-5.0	7.8-8.2	low	low-mod.	
		50-100+	CS-GrS	SP	A-1	-	20	5	25	7.8-8.2	low	low	
CYN1	Croyon, shale gravel	25-50	L-CL	CL	A-6	90-100	60-95	35-75	1.5-5.0	7.8-8.2	low	mod.	2
		50-100+	CS-Grs & shale fragments	SP	A-1	-	20	5	25	7.8-8.2	low	low	

Table 8. Cont'd

Map Symbol	Soil Series	Depth (cm)	Classification			% Passing			Permea- bility* cm/hr	Reaction	Sulfate hazard**	Shrink- Swell	Depth to water table (m)
			USDA	Unified	AASHO	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (.074 mm)					
CZK	Cazlake	0-45	L-SiCL	CL or ML	A-4	95-100	85-95	60-95	0.5-2.0	7.6-8.0	low	mod.	at or near surface
		45-90	L-CL	CL	A-4,A-6	85-95	55-85	40-75	.25	7.8-8.4	mod.	mod.	
DGF	Darlingford	0-25	CL-L	CL	A-6	85-90	75-85	60-75	1.5-5.0	7.2-7.6	low	mod.	1.5
		25-70	SiCL-L	ML or CL	A-4,A-6	85-90	75-95	60-85	1.5-5.0	7.8-8.2	low	mod.	
		70-100+	CL-L	CL	A-4,A-6	85-90	55-75	40-60	0.5	7.8-8.2	low	mod.	
DLN	Danlin	0-40	CL	CL	A-7-6	100	100	90-100	1.5	7.4-7.8	low	mod.	
		40-70	SiCL-SiC	CL,MH	A-6,A-7-6	100	100	95-100	0.2	6.8-7.2	low	mod.	
		70-95	SiCL	CL	A-6	100	100	95-100	0.5-2.0	7.4-7.8	low	mod.	1.2
		95-110	SiL	CL,ML	A-6,A-4	100	100	95-100	0.5-2.0	7.8-8.2	low	mod.-low	
DZW	Dezwood	0-25	CL-L	CL	A-6	85-90	75-85	60-75	1.5-5.0	7.2-7.6	low	mod.	1.5
		25-70	SiCL-L	ML or CL	A-4,A-6	85-90	75-95	60-85	1.5-5.0	7.8-8.2	low	mod.	
		70-100	CL-L	CL	A-4,A-6	85-90	55-75	40-60	0.5	7.8-8.2	low	mod.	
FFR	Fifere	30-80	CL	CL to CH	A-6,A-7-6	90-95	80-95	75-90	1.5-5.0	6.6-7.0	low	mod.	2
		80-110	L-CL	CL	A-6	85-95	80-90	70-85	5.0-1.5	7.6-8.2	low	mod.	
FIR	Firdale	0-40	CL	CL	A-7-6	100	100	90-100	0.5-2.0	6.6-7.3	low	mod.	
		40-60	SiC	CL,MH	A-6,A-7-6	100	100	95-100	0.2	6.6-7.3	low	mod.	2
		60-110	SiCL	CL	A-6	100	100	95-100	0.5-2.0	6.6-7.3	low	mod.	
		110+	SiL	CL,ML	A-6,A-4	100	100	95-100	0.5-2.0	7.4-7.8	low	mod.	
FRS	Ferris	0-40	L-SiCL	CL or ML	A-4	95-100	85-95	60-95	0.5-2.0	7.6-8.0	low	mod.	seasonal .7
		40-100	L-CL	CL	A-4,A-6	85-95	55-85	40-75	.25	7.8-8.4	mod.	mod.	
GRR	Guerra	0-40	CL	CL	A-6	90-100	90-100	75-85	.3	7.8-8.2	low	mod.	at or near surface
		40-70	SiCL-CL	ML or CL	A-4,A-6	85-95	75-85	60-75	-	7.8-8.4	low	mod.	
		70-100	L-CL	CL	A-4,A-6	85-90	55-75	40-60	-	7.8-8.4	mod.	mod.	
GRR/xxxs	Guerra, saline phase	Similar to above, contains appreciable soluble salts									severe		

Table 8. Cont'd

Map Symbol	Soil Series	Depth (cm)	Classification			% Passing			Permea-bility* cm/hr	Reaction	Sulfate hazard**	Shrink-Swell	Depth to water table (m)
			USDA	Unified	AASHO	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (.074 mm)					
HIT	Hilton	0-20	L-CL	CL	A-6,A-7-5	85-95	80-95	60-75	1.5-5.0	7.6-8.0	low	mod.	2
		20-60	L-SiCL	CL to ML	A-4	85-95	80-90	60-75	0.5-2.0	7.8-8.4	low	mod.	
		60-100	L-CL	SC to CL	A-6,A-4	85-95	75-90	40-65	.5	7.8-8.4	mod.	mod.	
HKS	Hickson	0-20	L-CL	CL	A-6,A-7-5	85-95	80-95	60-75	0.1-0.5	7.4-7.8	low to mod.	mod.	at or near
		20-40	L-SiCL	CL to ML	A-4	85-95	80-90	60-75	.1	7.8-8.4	mod.	mod.	
		60-100	L-CL	SC to CL	A-6,A-4	85-95	75-90	40-65	.1	7.8-8.4	mod.	mod.	
HKS xxxs	Hickson, saline phase	Similar to above, contains appreciable salts									severe		
HOS	Horose	0-25	L	ML	A-4	80-85	70-75	60-65	2.0-6.0	7.5-8.0	low	low	seasonal
		25+	L-CL	ML-CL	A-4,A-6	80-85	70-75	60-65	0.1-2.0	7.7-8.4	mod.	mod.	at surface
JYL	Joyale	0-30	CL	CL	A-6	100	100	75-85	1-2.5	7.4-7.8	low	high	seasonal
		30-60	SiCL-CL	ML or CL	A-4,A-6	85-95	75-85	60-75	.2	7.8-8.2	mod.	mod.	.6
		60-100+	L-CL	CL	A-4,A-6	85-90	55-75	40-60	.1	7.8-8.2	mod.	mod.	
JYL xxxs	Joyale, saline phase	Similar to above, contains appreciable soluble salts									severe		
KIS	Kingsley	0-40	CL	CL	A-6	100	100	75-85	1.5-2.5	6.8-7.2	low	mod.	
		40-70	L-SiCL	ML to CL	A-4,A-6	85-95	75-85	60-75	0.5-2.0	7.0-7.6	low	mod.	
		70-100	L-CL	CL	A-4,A-6	85-95	55-75	40-60	.2	7.2-7.8	low	mod.	2
KUD	Knudson	0-50	CL	CL	A-6	100	100	70-85	1.5-2.5	7.2-7.6	low	mod.	1.5
		50-70	SiCL	ML or CL	A-4,A-6	85-90	75-85	60-75	.5-2.0	7.8-8.2	low	mod.	
		70-100	L-CL	CL	A-4,A-6	85-90	55-75	40-60	.5	7.8-8.2	low	mod.	
LEI	Levine	20-100	strat.SiL-CL	ML to CL	A-4,A-7-6	100	100	65-100	.5-2.0	7.8-8.4	mod.	flood prone	
LRY	Leary	0-25	LFS	SM	A-2	85-100	90-100	10-20	15-25	7.4-7.8	low	low	2
		25-75	GrLS-FGr	GW or GP	A-1	35-60	-	5	25	7.8-8.4	low	low	

Table 8. Cont'd

Map Symbol	Soil Series	Depth (cm)	Classification			% Passing			Permea-bility* cm/hr	Reaction	Sulfate hazard**	Shrink-Swell	Depth to water table (m)
			USDA	Unified	AASHO	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (.074 mm)					
LRY1	Leary, shale gravel	Similar to above, contains dominantly shale gravel at depth											
MXS	Manitou	30-80	CL	CL to CH	A-7-6	90-95	80-95	75-90	1.5-5.0	6.6-7.0	low	mod.	2
		80-100	CL	CL	A-6	85-95	80-90	70-85	1.5-5.0	7.6-7.8	low	mod.	
NKK	Nikkel	0-40	L-SiCL	CL or ML	A-4	95-100	85-95	60-95	.5-2.0	7.6-8.0	low	mod.	seasonal
		40-100	L-CL	CL	A-4,A-6	85-95	55.85	40-75	.25	7.8-8.4	mod.	mod.	.7
NSH	Narish	0-40	CL	CL	A-6	90-100	90-100	75-85	.3	7.8-8.2	low	mod.	at or near
		40-70	SiCL-CL	ML or CL	A-4,A-6	85-95	75-85	60-75	-	7.8-8.4	low	mod.	surface
		70-100	L-CL	CL	A-4,A-6	85-95	55-75	40-60	-	7.8-8.4	mod.	mod.	
NYO	Nayler	30-80	CL	CL to CH	A-6,A-7-6	90-95	80-95	75-90	1.5-5.0	6.6-7.0	low	mod.	2
		80-110	L-CL	CL	A-6	85-95	80-90	70-85	5-15	7.6-8.2	low	mod.	
OIV	Oliver	0-55	C-SiC	CH or OH	A-7-6	100	100	90-100	.05	7.3-7.8	mod.	high	seasonal
		40-95	SiC-SiCL	CH-CL	A-7-6	100	100	75-90	.05	7.8-8.2	high	high	.8-1
		90-120	LVFS-FS	SM to ML	A-2 to A-4	100	100	5-50	6-13	7.8-8.4	mod.	low	
PBI	Pembina	0-25	CL-L	CL	A-6	85-90	75-85	60-75	1.5-5.0	7.2-7.6	low	mod.	1.5
		25-75	SiCL-L	ML or CL	A-4,A-6	85-90	75-95	60-85	1.5-5.0	7.8-8.2	low	mod.	
		75-100	CL-L	CL	A-4,A-6	85-90	55-75	40-60	0.5	7.8-8.2	low	mod.	
PBI1	Pembina, loamy substrate	0-25	CL-L	CL	A-6	85-90	75-85	60-75	1.5-5.0	7.2-7.6	low	mod.	1.5
		25-75	SiCL-L	ML or CL	A-4,A-6	85-90	75-95	60-85	1.5-5.0	7.8-8.2	low	mod.	
		75-100	L-SiL	CL,ML	A-6,A-4	100	100	90-100	0.5-2.0	7.8-8.2	low	mod.	
PBI2	Pembina, gravelly substrate	0-25	CL-L	CL	A-6	85-90	75-85	60-75	1.5-5.0	7.2-7.6	low	mod.	1.5
		25-75	SiCL-L	ML or CL	A-4,A-6	85-90	75-95	60-85	1.5-5.0	7.8-8.2	low	mod.	
		75-100	GrLS	GW or Gp	A-1	35-60	-	5	25	7.8-8.2	low	low	

Table 8. Cont'd

Map Symbol	Soil Series	Depth (cm)	Classification			% Passing			Permea-bility* cm/hr	Reaction	Sulfate hazard**	Shrink-Swell	Depth to water table (m)
			USDA	Unified	AASHO	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (.074 mm)					
PDA	Prodan	0-30	CL	CL	A-7-6	100	100	90-100	1.5-5.0	7.6-8.0	low	mod.	
		30-60	CL-SiCL	CL	A-6,A-7-6	100	100	95-100	1.5-5.0	7.8-8.4	low	mod.	0.7
		60-100	VFSL-SiL	ML to CL	A-6	100	100	95-100	0.5-1.5	7.8-8.4	mod.	low to mod.	
PER	Perillo	0-60	OM	Pt	-	-	-	-	-	7.8-8.2	-	-	at surface
		60-85	FSL-SiL	OL	-	100	100	40-95	0.5-5.0	7.8-8.2	mod.	-	
		85-125	FS-SiL	SM to ML	A-2-4,A-4	100	100	25-90	1.5-15.0	7.8-8.2	mod.	low	
PYR	Poyser	25-70	SiCL-CL-C	CL to CH	A-7-6	85-90	75-95	60-85	1.5-5.0	7.8-8.2	low	high	2
		70-100+	CL	CL to CH	A-6,A-7-6	85-90	55-75	[illegible]0-60	0.5	7.8-8.2	low	mod. to high	
PYR1	Poyser, loam substrate	25-70	SiCL-CL	CL to CH	A-7-6	85-90	75-95	60-85	1.5-5.0	7.8-8.2	low		2
		70-100	L-SiL	CL,ML	A-6,A-4	100	100	90-100	0.5-2.0	7.8-8.2	low	mod.	
PYR2	Poyser, gravelly substrate	25-70	SiCL-CL	CL to CH	A-7-6	85-90	75-95	60-85	1.5-5.0	7.8-8.2	low	high	2
		70-100	GrLS	GW or Gp	A-1	35-60	-	5	25	7.8-8.2	low	low	
RAM	Ramada	0-20	L-CL	CL	A-7-6	100	100	85-95	1.5-3.0	7.0-7.4	low	mod. to	2
		20-75	SiCL	CL	A-7-6	100	100	85-95	1.5-3.0	7.4-7.8	low	mod. to high	
		75-100	L-SiCL	CL	A-6,A-7-6	100	100	80-90	.5-2.0	7.8-8.4	low	mod.	
TDP	Tadpole	0-30	CL	CL	A-7-6	100	100	90-100	90-100	-	low to mod.	mod.	at surface
		30-60	CL-SiCL	CL	A-6,A-7-6	100	100	95-100	-	7.8-8.4	low to mod.	mod.	
		60-100	strat.VFSL-SiL-SiCL	ML to CL	A-4,A-6	100	100	95-100	-	7.8-8.4	low to mod.	mod.	

Table 8. Cont'd

Map Symbol	Soil Series	Depth (cm)	Classification			% Passing			Permea-bility* cm/hr	Reaction	Sulfate hazard**	Shrink-Swell	Depth to water table (m)
			USDA	Unified	AASHO	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (.074 mm)					
TGL	Tiger Hills	0-20	L-CL	CL	A-7-5,A-6	85-95	80-95	60-75	1.5-5.0	7.6-8.0	low	mod.	2
		20-60	L-SiCL	CL to ML	A-4	85-95	80-90	60-75	0.5-2.0	7.8-8.4	low	mod.	
		60-100	CL-L	CL to SC	A-6,A-4	85-95	75-90	40-65	.5	7.8-8.4	mod.	mod.	
TGL1	Tiger Hills loamy substrate	0-20	L-CL	CL	A-7-5,A-6	85-95	80-95	60-75	1.5-5.0	7.6-8.0	low	mod.	2
		20-60	L-SiCL	CL to ML	A-4	85-95	80-90	60-75	0.5-2.0	7.8-8.4	low	mod.	
		60-100	SiL-VFSL	ML to CL	A-6	100	100	90-100	0.5-1.5	7.8-8.4	mod.	low to mod.	
TLI	Tellier	0-30	CL	CL	A-6	100	100	75-85	1-2.5	7.4-7.8	low	high	seasonal .8
		30-60	SiCL-CL	ML or CL	A-4,A-6	85-95	75-85	60-75	.2	7.8-8.2	mod.	mod.	
		60-100	L-CL	CL	A-4,A-6	85-90	55-75	40-60	.1	7.8-8.2	mod.	mod.	
TNT	Trinton	0-25	L-CL	CL	A-6	90-100	85-95	60-80	1.5-5.0	7.2-7.8	low	mod.	2
		25-50	L-CL	CL	A-6	90-100	60-95	35-65	1.5-5.0	7.8-8.2	low	mod.	
		50-100	Cs-GrS	SP	A-1	-	20	5	25	7.8-8.2	low	low	
ULH	Ullrich	0-15	CL	CL	A-6	100	100	65-85	1.5-2.0	7.3-7.8	low	mod.	seasonal
		15-40	CL	CL	A-6	100	100	65-85	1.5-2.0	7.6-8.0	low	mod.	
		40-80	L-SiCL	CL or ML	A-4	85-100	75-95	60-90	.5-1.5	7.8-8.2	low	mod.	
		80-100+	L-CL	CL	A-4,A-6	85-90	55-80	40-70	.2	7.8-8.2	mod.	mod.	
VDL	Vandal	0-25	L-CL	CL	A-6	90-100	85-95	60-80	1.5-5.0	7.2-7.8	low	mod.	2
		25-50	L-CL	CL	A-6	90-100	60-95	35-65	1.5-5.0	7.8-8.2	low	mod.	
		50-100	Cs-GrS	SP	A-1	-	20	5	25	7.8-8.2	low	low	
VDL1	Vandal, shale gravel	25-50	L-CL	CL	A-6	90-100	60-95	35-65	1.5-5.0	7.8-8.2	low	mod.	2
		50-100+	CS-GrS+ shale fragments	SP	A-1	-	20	5	25	7.8-8.2	low	low	
VDL2	Vandal, sandy substrate	25-50	L-CL	CL	A-6	90-100	80-90	60-80	1.5-5.0	7.6-8.0	low	mod.	2
		50-100	LS-LFS	SM	A-3,A-2-4	100	80-100	10-35	15-25	7.6-8.0	low	low	

Table 8. Cont'd

Map Symbol	Soil Series	Depth (cm)	Classification			% Passing			Permea-bility* cm/hr	Reaction	Sulfate hazard**	Shrink-Swell	Depth to water table (m)
			USDA	Unified	AASHO	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (.074 mm)					
VTL	Vartel	0-40	L-CL	CL	A-6,A-7-5	95-100	85-95	40-55	1.5-5.0	7.6-8.0	low to mod.	mod.	
		40-70	Gr-SL	SM	A-1,A-2	-	50	15-30	25-50	7.8-8.2	low to mod.	low	0.8
		70-100	GrS	Sp or GP	A-1	-	45	5	50	7.8-8.2	low to mod.	low	
VTL1	Vartel, shale gravel	0-40	L-CL	CL	A-6,A-7-5	95-100	85-95	40-55	1.5-5.0	7.6-8.0	low to mod.	mod.	0.8
		40-70	Gr-SL	SM	A-1,A-2	-	50	15-30	25.0-50.0	7.8-8.2	low to mod.		0.8
		70+	GrS+ shale gragments	SP or GP	A-1	-	45	5	50.0	7.8-8.2	low to mod.	low	
XVI	Xavier	0-130	Om	Pt	-	-	-	-	1.5-15	7.8-8.2	mod.	low	
		130-150	FS-SiL	SM,ML	A-2-4	100	100	25-90	1.5-15	7.8-8.2	mod.	low	
ZFI	Zaplin	0-40	L-SiCL	CL or ML	A-4	-	85-95	60-95	0.5-2.0	7.6-8.0	low	mod.	seasonal 0.7
		40-100	L-CL	CL	A-4,A-6	85-95	55-85	40-75	0.25	7.8-8.4	mod.	mod.	

TABLE 9

Suitability Ratings and Limitations for Soils in the Study Area for Selected Engineering Uses

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
ATN	Altamont	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fa	Fk
ATN /xcxx	Altamont	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fa	Fk
ATN /lclx	Altamont	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Ft	Fk
ATN /xdxx	Altamont	Fsd	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
BWO	Barwood	Fs	Va	Faw	Pw	Faw	P	Fw	Fs	Fa	Ph
CAV	Carvey	Fs	Phq	Pw	Pw	Pw	Vwg	Vhg	Pw	Vhg	Vhg
CKD /xxxs	Crookdale	Pn	Paq	Faw	Pwn	Fw	Vs	Pk	Fs	Pa	Ph
CKD /3xxx	Crookdale	Fs	Ps	Faw	Pw	Fw	Vs	Pk	Fs	Ps	Fh
CXT	Capell	Fb	Faq	Fw	Pw	Fw	Vsk	Pk	Pq	Vka	Phg
CXV	Charman	Fsb	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
CYN /xcxx	Croyon	Fbs	Fq	G	G	G	Vsk	Vkg	Pq	Vka	Gg
CYN /xdxx	Croyon	Fts	Fq	G	G	G	Vsk	Vkg	Pq	Vka	Gg
CYN /xfxx	Croyon	Vt	Fq	Ft	Pt	Pt	Vsk	Vkg	Ptq	Vt	Ptg
CYN /3fxx	Croyon	Vtb	Fq	Ft	Pt	Pt	Vsk	Vkg	Ptq	Vt	Ptg
CYN1/2exx	Croyon	Ptb	Fq	Fa	Fat	Ft	Vsk	Vkg	Pq	Vt	Ftg
CZK	Cazlake	Fs	Va	Vh	Vh	Pw	Vhw	Vh	Pw	Fa	Vh
CZKp	Cazlake	Vw	Va	Vw	Vhw	Vw	Vhw	Vhw	Vw	Fa	Vh
DGF	Darlingford	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fa	Fk
DGF /xcxx	Darlingford	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fat	Fk
DGF /xe2x	Darlingford	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
DLN	Danlin	Fs	Va	Faw	Pw	Fw	Pw	Fw	Fs	Fa	Ph
DLN /xcxx	Danlin	Fs	Va	Faw	Pw	Fw	Pw	Fw	Fs	Fat	Ph
DXM	Druxman	Fs	Fq	Fw	Pw	Fw	Vsg	Vkg	Fs	Vkg	Phg
DZW	Dezwood	Fsb	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
DZW /xxlx	Dezwood	Fsb	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
DZW /lxlx	Dezwood	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DZW /xcxx	Dezwood	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DZW /xclx	Dezwood	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DZW /lcxx	Dezwood	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
DZW /lclx	Dezwood	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk

TABLE 9

Suitability Ratings and Limitations for Soils in the Study Area for Selected Engineering Uses

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
DZW /xdxx	Dezwood	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /1dxx	Dezwood	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /2d1x	Dezwood	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /xd2x	Dezwood	Ftp	Va	Fa	Fap	Fa	Fsp	G	Fsp	Pt	Fk
DZW /3d1x	Dezwood	Vb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /2dxx	Dezwood	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /1d1x	Dezwood	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /xd1x	Dezwood	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
DZW /xexx	Dezwood	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /1exx	Dezwood	Ptb	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /xe1x	Dezwood	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /1e1x	Dezwood	Pbt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
DZW /2exx	Dezwood	Ptb	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /2e1x	Dezwood	Ptb	Va	Fa	Fat	Fat	Fs	Ft	Fts	Vt	Fkt
DZW /3f1x	Dezwood	Vtb	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
DZW /3f2x	Dezwood	Vtb	Va	Fat	Pt	Pt	Fsp	Pt	Pt	Vt	Pt
FFR	Fifere	Pbs	Va	Fa	Fa	Fa	Pk	Pk	Fs	Fk	Fk
FFR /xcxx	Fifere	Pbs	Va	Fa	Fa	Fa	Pk	Pk	Fs	Ft	Fk
FFR /1cxx	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Pt	Fk
FFR /1c1x	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Ft	Fk
FFR /xdxx	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Pt	Fk
FFR /1dxx	Fifere	Vb	Va	Fa	Fa	Fa	Pk	Pk	Fs	Pt	Fk
FFR /1d1x	Fifere	Vb	Va	Fa	Fat	Fa	Pk	Pk	Fs	Pt	Fkt
FFR /xexx	Fifere	Vb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
FFR /1exx	Fifere	Vb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
FFR /2exx	Fifere	Vb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
FFR /2e1x	Fifere	Vb	Va	Fa	Fat	Fat	Pk	Pk	Fst	Vt	Fkt
FFR /xfxx	Fifere	Vb	Va	Fat	Pt	Pt	Pk	Ptk	Pt	Vt	Pt
FIR	Firdale	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fa	Fk
FIR /xcxx	Firdale	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fat	Fk

TABLE 9

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Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
FIR /1cxx	Firdale	Fsb	Va	Fa	Fa	Fa	Fs	G	Fs	Fat	Fk
FIR /3cxx	Firdale	Vb	Va	Fa	Fa	Fa	Fs	G	Fs	Fat	Fk
FIR /xdxx	Firdale	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
FIR /1dxx	Firdale	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
FIR /2dxx	Firdale	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
FIR /xexx	Firdale	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
FIR /1exx	Firdale	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
FIR /2exx	Firdale	Vb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
FIR /3exx	Firdale	Vb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
FIR /2fxx	Firdale	Vt	Va	Ft	Pt	Pt	Fs	Pt	Pt	Vt	Pt
FIR /3fxx	Firdale	Vbt	Va	Ft	Pt	Pt	Fs	Pt	Pt	Vt	Pt
FRS	Ferris	Fbs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Pk
FSO	Fresno	Pbs	Va	Faw	Pw	Faw	Pw	Pgk	Fs	Fk	Ph
FSO /xcxx	Fresno	Pbs	Va	Faw	Pw	Faw	Pw	Pgk	Fs	Ftk	Ph
GRR	Guerra	Fs	Va	Vh	Vh	Pw	Vw	Vh	Pw	Fa	Vh
GRRp	Guerra	Vw	Va	Vw	Vhw	Vw	Vhw	Vhw	Vw	Fa	Vhi
GRR /xxxs	Guerra	Psn	Va	Vh	Vh	Pw	Vw	Vh	Pw	Fa	Vh
GRRp/xxxs	Guerra	Vw	Va	Vh	Vhw	Vw	Vhw	Vhw	Vw	Fa	Vh
HIT /xcxx	Hilton	Fb	Va	Fa	Fa	Fa	Fa	G	Fs	Ftk	Fk
HIT /1cxx	Hilton	Pb	Va	Fa	Fa	Fa	Fa	G	Fs	Ftk	Fk
HIT /xc1x	Hilton	Fb	Va	Fa	Fa	Fa	Fa	G	Fs	Ftk	Fk
HIT /xc2x	Hilton	Fbp	Va	Fa	Fap	Fa	Fap	G	Fsp	Ftk	Fk
HIT /1c1x	Hilton	Pb	Va	Fa	Fa	Fa	Fa	G	Fs	Ftk	Fk
HIT /2c1x	Hilton	Pb	Va	Fa	Fa	Fa	Fa	G	Fs	Ftk	Fk
HIT /2c2x	Hilton	Pb	Va	Fa	Fap	Fa	Fap	G	Fsp	Ftk	Fk
HIT /xdxx	Hilton	Ft	Va	Fa	Fa	Fa	Fa	G	Fs	Pt	Fk
HIT /1dxx	Hilton	Ftb	Va	Fa	Fa	Fa	Fa	G	Fs	Pt	Fk
HIT /xd1x	Hilton	Ft	Va	Fa	Fa	Fa	Fa	G	Fs	Pt	Fk
HIT /1d1x	Hilton	Ftb	Va	Fa	Fa	Fa	Fa	G	Fs	Pt	Fk
HIT /xd2x	Hilton	Ftb	Va	Fa	Fap	Fa	Fap	G	Fsp	Pt	Fk

TABLE 9

Suitability Ratings and Limitations for Soils in the Study Area for Selected Engineering Uses

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
HIT /2d1x	Hilton	Pb	Va	Fa	Fa	Fa	Fa	G	Fs	Pt	Fk
HIT /2d2x	Hilton	Pb	Va	Fa	Fap	Fa	Fap	G	Fsp	Pt	Fk
HIT /3d2x	Hilton	Vb	Va	Fa	Fap	Fa	Fap	G	Fsp	Pt	Fk
HIT /xe1x	Hilton	Pt	Va	Fa	Fat	Fat	Fa	Ft	Fst	Vt	Fkt
HIT /1e1x	Hilton	Ptb	Va	Fa	Fat	Fat	Fa	Ft	Fst	Vt	Fkt
HIT /1e2x	Hilton	Ptb	Va	Fa	Fat	Fat	Fap	Ft	Fst	Vt	Fkt
HIT /2e2x	Hilton	Vb	Va	Fa	Fat	Fat	Fap	Ft	Fst	Vt	Fkt
HIT /2e1x	Hilton	Vb	Va	Fa	Fat	Fat	Fa	Ft	Fst	Vt	Fkt
HIT /2e3x	Hilton	Vb	Va	Fap	Pp	Fpt	Pp	Ft	Pp	Vt	Fkt
HIT /3e1x	Hilton	Vb	Va	Fa	Fat	Fat	Fa	Ft	Fst	Vt	Fkt
HIT /3e2x	Hilton	Vb	Va	Fa	Fat	Fat	Fap	Ft	Fst	Vt	Fkt
HIT /2fxx	Hilton	Vtb	Va	Fat	Pt	Pt	Fa	Pt	Pt	Vt	Pt
HIT /2f1x	Hilton	Vtb	Va	Fat	Pt	Pt	Fa	Pt	Pt	Vt	Pt
HIT /2f2x	Hilton	Vtb	Va	Fat	Pt	Pt	Fap	Pt	Pt	Vt	Pt
HIT /3f1x	Hilton	Vtb	Va	Fat	Pt	Pt	Fa	Pt	Pt	Vt	Pt
HKS	Hickson	Fs	Va	Vh	Vh	Pw	Vw	Vh	Pw	Fa	Vh
HKS /xxxs	Hickson	Pn	Va	Vh	Vh	Pw	Vw	Vh	Pw	Fa	Vh
HKSp	Hickson	Vw	Va	Vw	Vhw	Vw	Vwh	Vh	Vw	Fa	Vh
HKSp/xxxs	Hickson	Vw	Va	Vw	Vhw	Vw	Vwh	Vh	Vw	Fa	Vh
HOS	Horose	Fs	Va	Vh	Vh	Pw	Vhw	Vh	Pw	Fa	Vh
JYL	Joyale	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
JYL /xxxs	Joyale	Pn	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
JYL /xx1x	Joyale	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
JYL /xcxx	Joyale	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fkt	Ph
KIS	Kingsley	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
KIS /xcxx	Kingsley	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
KIS /1cxx	Kingsley	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
KUD	Knudson	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
KUD /xcxx	Knudson	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
KUD /ocxx	Knudson	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk

TABLE 9

Suitability Ratings and Limitations for Soils in the Study Area for Selected Engineering Uses

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
KUD /xclx	Knudson	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
KUD /xdxx	Knudson	Fst	Va	Fa	Fa	Fa	Fs	G	Fg	Pt	Fk
LEI	Levine	Fis	Va	Faw	Piw	Pi	Pi	Pig	Fs	Vi	Pi
LRY	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vka	Gg
LRY /xcxx	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vka	Gg
LRY /lclx	Leary	Ps	G	G	G	G	Vsk	Vk	Vs	Vka	Gg
LRY /ldlx	Leary	Pst	G	G	G	G	Vsk	Vk	Vs	Vka	Gg
LRY /2d2x	Leary	Pst	G	G	Fp	G	Vsk	Vk	Vs	Vka	Gg
LRY /xexx	Leary	Pst	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /lexx	Leary	Pst	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /xelx	Leary	Pst	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /lelx	Leary	Pst	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /2exx	Leary	Vb	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /3exx	Leary	Vb	G	G	Ft	Ft	Vsk	Vk	Vs	Vkt	Ftg
LRY /xfxx	Leary	Vt	G	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Pt
LRY /lfxx	Leary	Vt	G	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Pt
LRY /2fxx	Leary	Vtb	G	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Pt
LRY /3fxx	Leary	Vtb	G	Ft	Pt	Pt	Vsk	Vk	Vs	Vkt	Pt
LRY1	Leary	Ps	Fa	Fa	Fa	Fa	Vsk	Vk	Vs	Vk	Pt
LRY1/xdxx	Leary	Ps	Fa	Fa	Fa	Fa	Vsk	Vk	Vs	Vk	Pt
LRY1/xfxx	Leary	Vt	Fa	Fat	Pt	Pt	Vsk	Vk	Vs	Vkt	Pt
MXS /xcxx	Manitou	Fb	G	Fa	Fa	Fa	Fsk	Fk	Fs	Fk	Fk
MXS /xdxx	Manitou	Ft	G	Fa	Fa	Fa	Fsk	Fk	Fs	Fk	Fk
NKK	Nikkel	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
NKK /xxlx	Nikkel	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fa	Ph
NSH	Narish	Fs	Va	Vh	Vh	Pw	Vw	Vh	Pw	Fa	Vh
NYO /xcxx	Nayler	Vb	Va	Fa	Fa	Fa	Pk	Pgk	Fs	Pk	G
NYO /xdxx	Nayler	Vb	Va	Fa	Fa	Fa	Pk	Pgk	Fs	Pkt	G
NYO /ldxx	Nayler	Vb	Va	Fa	Fa	Fa	Pk	Pgk	Fs	Pkt	G
NYO /ldlx	Nayler	Vb	Va	Fa	Fa	Fa	Pk	Pgk	Fs	Pkt	G

TABLE 9

Suitability Ratings and Limitations for Soils in the Study Area for Selected Engineering Uses

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
NYO /xexx	Nayler	Vb	Va	Fa	Fat	Fat	Pk	Pgk	Fst	Vt	Ft
NYO /1exx	Nayler	Vb	Va	Fa	Fat	Fat	Pk	Pgk	Fst	Vt	Ft
NYO /1e1x	Nayler	Vb	Va	Fa	Fat	Fat	Pk	Pgk	Fst	Vt	Ft
NYO /2exx	Nayler	Vb	Va	Fa	Fat	Fat	Pk	Pgk	Fst	Vt	Ft
NYO /2e1x	Nayler	Vb	Va	Fa	Fat	Fat	Pk	Pgk	Fst	Vt	Ft
NYO /3exx	Nayler	Vb	Va	Fat	Fat	Fat	Pk	Pgk	Fst	Vt	Ft
NYO /xfxx	Nayler	Vt	Va	Fat	Pt	Pt	Pk	Pgk	Pt	Vt	Pt
NYO /1fxx	Nayler	Vt	Va	Fat	Pt	Pt	Pk	Pgk	Pt	Vt	Pt
NYO /1f1x	Nayler	Vt	Va	Fat	Pt	Pt	Pk	Pgk	Pt	Vt	Pt
NYO /2fxx	Nayler	Vt	Va	Fat	Pt	Pt	Pk	Pgk	Pt	Vt	Pt
NYO /2f1x	Nayler	Vt	Va	Fat	Pt	Pt	Pk	Pgk	Pt	Vt	Pt
NYO /2f2x	Nayler	Vt	Va	Fat	Pt	Pt	Pk	Pgk	Pt	Vt	Pt
OIV /xxxs	Oliver	Psn	Va	Fw	Paw	Faw	Pws	Pk	Ps	Fa	Pkh
PBI	Pembina	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
PBI /xcxx	Pembina	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
PBI /1cxx	Pembina	Fsb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
PBI /1c1x	Pembina	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
PBI /1c2x	Pembina	Fsp	Va	Fa	Fap	Fa	Fsp	G	Fsp	Fkt	Fk
PBI /2c1x	Pembina	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
PBI /xdxx	Pembina	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
PBI /1dxx	Pembina	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
PBI /1d1x	Pembina	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
PBI /xd1x	Pembina	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
PBI /1d2x	Pembina	Ftc	Va	Fa	Fap	Fa	Fsp	G	Fsp	Pt	Fk
PBI /2d1x	Pembina	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fkt
PBI /2e1x	Pembina	Pbt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI /xexx	Pembina	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI /1exx	Pembina	Vb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI /1e1x	Pembina	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI /2exx	Pembina	Vb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt

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Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
PBI /1fxx	Pembina	Vt	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
PBI /2f1x	Pembina	Vt	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
PBI /3fxx	Pembina	Vtb	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
PBI /3f1x	Pembina	Vtb	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
PBI1/1c1x	Pembina	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
PBI1/xdxx	Pembina	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
PBI1/xd1x	Pembina	Fst	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
PBI1/1dxx	Pembina	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
PBI1/1e1x	Pembina	Ptb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI1/2e1x	Pembina	Vb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI1/2exx	Pembina	Vb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PBI1/xfxx	Pembina	Vt	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
PBI1/2fxx	Pembina	Vtb	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
PBI2/1d1x	Pembina	Fs	Pq	G	G	G	Vks	Vk	Pq	Vk	G
PDA	Prodan	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
PDA /xxxs	Prodan	Pn	Va	Faw	Pwn	Faw	Pw	Fw	Fs	Fk	Ph
PDA /xcxx	Prodan	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fkt	Ph
PER	Perillo	G	Va	Va	Vaw	Vaw	Vsw	Vw	Vsw	Va	Vh
PYR /xcxx	Poyser	Vb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
PYR /1c1x	Poyser	Vb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
PYR /xd1x	Poyser	Vbt	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
PYR /1d1x	Poyser	Vbt	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
PYR /2e1x	Poyser	Vb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PYR1/1exx	Poyser	Vb	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
PYR1/1fxx	Poyser	Vb	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
PYR1/2fxx	Poyser	Vb	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
PYR2/xcxx	Poyser	Vb	Pq	G	G	G	Vsk	Vk	Pq	Vk	G
PYR2/1cxx	Poyser	Vb	Pq	G	G	G	Vsk	Vk	Pq	Vk	G
PYR2/1c1x	Poyser	Vb	Pq	G	G	G	Vsk	Vk	Pq	Vk	G
PYR2/xdxx	Poyser	Vb	Pq	G	G	G	Vsk	Vk	Pq	Vk	G

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Suitability Ratings and Limitations for Soils in the Study Area for Selected Engineering Uses

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
PYR2/1dxx	Poyser	Vb	Pq	G	G	G	Vsk	Vk	Pq	Vk	G
PYR2/1d1x	Poyser	Vb	Pq	G	G	G	Vsk	Vk	Pq	Vk	G
PYR2/2d1x	Poyser	Vb	Pq	G	G	G	Vsk	Vk	Va	Vk	G
PYR2/1e2x	Poyser	Vb	Pq	G	Ft	Ft	Vsk	Vk	Pq	Vkt	Ft
RAM	Ramada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fk	Fk
RAM /xcxx	Ramada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
RAM /1cxx	Ramada	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Ft	Fk
RAM /xdxx	Ramada	Ft	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
TDP	Tadpole	Fs	Va	Pw	Vw	Pw	Vw	Pw	Pw	Fa	Vh
TDPp	Tadpole	Vw	Va	Vh	Vwh	Vw	Vhw	Vh	Vw	Fa	Vh
TDP /xxxs	Tadpole	Pn	Va	Pw	Vwh	Pw	Vw	Pw	Pw	Fa	Vh
TDP /xxxu	Tadpole	Vn	Va	Pw	Vwh	Pw	Vw	Pw	Pw	Fa	Vh
TGL /xcxx	Tiger Hills	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
TGL /1c1x	Tiger Hills	Fb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
TGL /xc1x	Tiger Hills	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
TGL /2cxx	Tiger Hills	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
TGL /2c1x	Tiger Hills	Pb	Va	Fa	Fa	Fa	Fs	G	Fs	Fkt	Fk
TGL /3c2x	Tiger Hills	Vb	Va	Fa	Fa	Fa	Fsp	G	Fs	Fkt	Fk
TGL /xdxx	Tiger Hills	Ft	Va	Fa	Fa	Fa	Fs	G	Fsp	Pt	Fk
TGL /xd3x	Tiger Hills	Pc	Va	Fa	Fa	Fa	Pp	G	Pp	Pt	Fk
TGL /1d1x	Tiger Hills	Fpb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
TGL /1e1x	Tiger Hills	Ppt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
TGL /1e2x	Tiger Hills	Ptc	Va	Fa	Fpt	Fat	Fsp	Ft	Fst	Vt	Fkt
TGL /1e3x	Tiger Hills	Pct	Va	Fap	Pp	Fpt	Pp	Ft	Pp	Vt	Fkt
TGL /2exx	Tiger Hills	Pbt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
TGL /2e1x	Tiger Hills	Pbt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
TGL /2e2x	Tiger Hills	Pbt	Va	Fa	Fpt	Fat	Fsp	Ft	Fst	Vt	Fkt
TGL /xfxx	Tiger Hills	Vt	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
TGL /1fxx	Tiger Hills	Vt	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
TGL /2f1x	Tiger Hills	Vt	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt

TABLE 9

Suitability Ratings and Limitations for Soils in the Study Area for Selected Engineering Uses

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
TGL /2f2x	Tiger Hills	Vt	Va	Fat	Pt	Pt	Fsp	Pt	Pt	Vt	Pt
TGL /3f2x	Tiger Hills	Vtb	Va	Fat	Pt	Pt	Fsp	Pt	Pt	Vt	Pt
TGL /3f3x	Tiger Hills	Vtb	Va	Ftp	Ppt	Pt	Pp	Pt	Ptp	Vt	Pt
TGL1/xdxx	Tiger Hills	Ft	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
TGL1/3d1x	Tiger Hills	Vb	Va	Fa	Fa	Fa	Fs	G	Fs	Pt	Fk
TGL1/xexx	Tiger Hills	Pt	Va	Fa	Fat	Fat	Fs	Ft	Fst	Vt	Fkt
TGL1/2f1x	Tiger Hills	Vt	Va	Fat	Pt	Pt	Fs	Pt	Pt	Vt	Pt
TLI	Tellier	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
TLI /xc1x	Tellier	Pb	Va	Faw	Pw	Faw	Ph	Fw	Fs	Fkt	Ph
TNT	Trinton	Vb	Fq	G	G	G	Vsk	Vk	Pq	Vka	Gg
TNT /xcxx	Trinton	Vb	Fq	G	G	G	Vsk	Vk	Pq	Vka	Gg
TNT /1c1x	Trinton	Vb	Fq	G	G	G	Vsk	Vk	Pq	Vka	Gg
ULH	Ullrich	Fs	Va	Faw	Pw	Faw	Pw	Fw	Fs	Fk	Ph
VDL	Vandal	Fb	Fq	G	G	G	Vsk	Vk	Pq	Vka	Gg
VDL /xcxx	Vandal	Fb	Fa	G	G	G	Vsk	Vk	Pq	Vka	Gg
VDL /xc1x	Vandal	Fb	Fq	G	G	G	Vsk	Vk	Pq	Vka	Gg
VDL /xdxx	Vandal	Ft	Fq	G	G	G	Vsk	Vk	Pq	Vka	Gg
VDL /1dxx	Vandal	Ftb	Fa	G	G	G	Vsk	Vk	Pq	Vka	Gg
VDL /xexx	Vandal	Pt	Fq	G	Ft	G	Vsk	Vk	Pq	Vka	Ft
VDL /1exx	Vandal	Pt	Fq	G	Ft	Ft	Vsk	Vk	Pq	Vka	Ftg
VDL /xe1x	Vandal	Pt	Fq	G	Ft	Ft	Vsk	Vk	Pq	Vka	Ftg
VDL /2exx	Vandal	Ptb	Fq	G	Ft	Ft	Vsk	Vk	Vq	Vka	Ftg
VDL /3exx	Vandal	Vb	Fq	G	Ft	Ft	Vsk	Vk	Vq	Vka	Ftg
VDL /2fxx	Vandal	Vt	Fq	Ft	Pt	Pt	Vsk	Vk	Vq	Vka	Pt
VDL /3fxx	Vandal	Vtb	Fq	Ft	Pt	Pt	Vsk	Vk	Vq	Vka	Pt
VDL1	Vandal	Fb	Faq	G	G	Fa	Vsk	Vk	Pq	Vka	Gg
VDL1/xcxx	Vandal	Fb	Faq	G	G	Fa	Vsk	Vk	Pq	Vka	Gg
VDL1/1cxx	Vandal	Fb	Faq	Fa	Fa	Fa	Vsk	Vk	Pq	Vka	Gg
VDL1/1dxx	Vandal	Ftb	Faq	Fa	Fa	Fa	Vsk	Vk	Pq	Vka	Gg
VDL1/1exx	Vandal	Pt	Faq	Fa	Fat	Fat	Vsk	Vk	Pq	Vka	Ftg

TABLE 9

Suitability Ratings and Limitations for Soils in the Study Area for Selected Engineering Uses

Map Symbol and Phase	Soil Name	Top Soil	Sand & Gravel	Road Fill	Permanent Bldgs. With Basements	Local Roads and Streets	Sanitary Trench	Landfill Area	Cover Material	Sewage Lagoons	Septic Fields
VDL1/2exx	Vandal	Ptb	Faq	Fa	Fat	Fat	Vsk	Vk	Vq	Vka	Ftg
VDL1/1fxx	Vandal	Vt	Faq	Fat	Pt	Pt	Vsk	Vk	Pq	Vka	Pt
VDL2/xcxx	Vandal	Fb	Pa	Fa	G	G	Vsk	Vk	Pq	Vk	Gg
VDL2/1dxx	Vandal	Fbt	Pa	Fa	G	G	Vsk	Vk	Pq	Vk	Gg
VDL2/2dxx	Vandal	Fbt	Pa	Fa	G	G	Vsk	Vk	Vq	Vk	Gg
VDL2/2exx	Vandal	Pt	Pa	Fa	Ft	Ft	Vsk	Vk	Vq	Vk	Ftg
VTL	Vartel	Fb	Faq	Fw	Pw	Fw	Vsk	Vk	Pq	Vka	Ph
VTL1	Vartel	Fb	Faq	Fwa	Pw	Fwa	Vsk	Vk	Pq	Vka	Ph
XVI	Xavier	G	Va	Va	Vaw	Vaw	Vsw	Vw	Vsw	Vah	Vh
ZPI	Zaplin	Fb	Va	Faw	Pw	Faw	Phw	Fw	Fs	Fk	Ph
ZPI /2xxx	Zaplin	Pb	Va	Faw	Pw	Faw	Phw	Fw	Fs	Fk	Ph
ZPI /xcxx	Zaplin	Fb	Va	Faw	Pw	Faw	Phw	Fw	Fs	Fkt	Ph
ZPI /xclx	Zaplin	Fb	Va	Faw	Pw	Faw	Phw	Fw	Fs	Fkt	Ph

TABLE 10

Suitability Ratings and Limitations of Soils in the Study Area for Various Recreational Uses

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
ATN	Altamont	Fks	Fs	Fs	Fs	Fa
ATN /xcxx	Altamont	Fks	Fs	Fs	Fs	Fs
ATN /lclx	Altamont	Fst	Fs	Fs	Fs	Fa
ATN /xdxx	Altamont	Pt	Fs	Fs	Fs	Fa
BWO	Barwood	Fws	Fws	Fws	Fws	Faw
CAV	Carvey	Pw	Pw	Pw	Pw	Pw
CKD /xxxs	Crookdale	Pwn	Pwn	Pwn	Fsw	Fw
CKD /3xxx	Crookdale	Fw	Fw	Fw	Fsw	Fw
CXT	Capell	Fsw	Fsw	Fsw	Fsw	Fa
CXV	Charman	Fsw	Fsw	Fsw	Fsw	Fa
CYN /xcxx	Croyon	Fst	Fs	Fs	Fs	G
CYN /xdxx	Croyon	Pt	Fs	Fs	Fs	G
CYN /xfxx	Croyon	Vt	Pt	Pt	Fst	Pt
CYN /3fxx	Croyon	Vt	Pt	Pt	Fst	Pt
CYNl/2exx	Croyon	Vt	Fst	Fst	Fs	Ft
CZK	Cazlake	Pw	Pw	Pw	Pw	Vh
CZKp	Cazlake	Vws	Vsw	Vsw	Vsw	Vwh
DGF	Darlingford	Fs	Fs	Fs	Fs	Fa
DGF /xcxx	Darlingford	Fst	Fs	Fs	Fs	Fa
DGF /xe2x	Darlingford	Fst	Fst	Fst	Fs	Fat
DLN	Danlin	Fsw	Fsw	Fsw	Fsw	Faw
DLN /xcxx	Danlin	Fst	Fsw	Fsw	Fsw	Faw
DXM	Druxman	Fsw	Fsw	Fsw	Fsw	Fwa
DZW	Dezwood	Fs	Fs	Fs	Fs	Fa
DZW /xxlx	Dezwood	Fs	Fs	Fs	Fs	Fa
DZW /lxlx	Dezwood	Fs	Fs	Fs	Fs	Fa
DZW /xcxx	Dezwood	Fts	Fs	Fs	Fs	Fa
DZW /xclx	Dezwood	Fts	Fs	Fs	Fs	Fa
DZW /lcxx	Dezwood	Fst	Fs	Fs	Fs	Fa
DZW /lclx	Dezwood	Fts	Fs	Fsk	Fs	Fa
DZW /xdxx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /ldxx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /2dlx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /xd2x	Dezwood	Pt	Fs	Fsp	Fs	Fap
DZW /3dlx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /2dxx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /ldlx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /xdlx	Dezwood	Pt	Fs	Fs	Fs	Fa
DZW /xexx	Dezwood	Vt	Fst	Fts	Fs	Fta
DZW /lexx	Dezwood	Vt	Fst	Fst	Fs	Fta

TABLE 10

Suitability Ratings and Limitations of Soils in the Study Area for Various Recreational Uses

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
DZW /xe1x	Dezwood	Vt	Fst	Fts	Fs	Fta
DZW /1e1x	Dezwood	Vt	Fst	Fst	Fs	Fat
DZW /2exx	Dezwood	Vt	Fst	Fst	Fs	Fat
DZW /2e1x	Dezwood	Vt	Fst	Pts	Fs	Fta
DZW /3f1x	Dezwood	Vt	Pt	Pt	Fst	Pt
DZW /3f2x	Dezwood	Vt	Pt	Pt	Fst	Pt
FFR	Fifere	Fs	Fs	Fs	Fs	Fa
FFR /xcxx	Fifere	Fst	Fs	Fs	Fs	Fa
FFR /1cxx	Fifere	Fst	Fs	Fa	Fs	Fa
FFR /1c1x	Fifere	Fst	Fs	Fs	Fs	Fa
FFR /xdxx	Fifere	Pt	Fs	Fs	Fs	Fa
FFR /1dxx	Fifere	Pt	Fs	Fs	Fs	Fa
FFR /1d1x	Fifere	Pt	Fs	Fs	Fs	Fa
FFR /xexx	Fifere	Vt	Fst	Fst	Fs	Fat
FFR /1exx	Fifere	Vt	Fst	Fst	Fs	Fat
FFR /2exx	Fifere	Vt	Fst	Fst	Fs	Fat
FFR /2e1x	Fifere	Vt	Fst	Fst	Fs	Fat
FFR /xfxx	Fifere	Vt	Pt	Pt	Fts	Ft
FIR	Firdale	Fs	Fs	Fs	Fs	Fa
FIR /xcxx	Firdale	Fst	Fs	Fs	Fs	Fa
FIR /1cxx	Firdale	Fst	Fs	Fs	Fs	Fa
FIR /3cxx	Firdale	Fst	Fs	Fs	Fs	Fa
FIR /xdxx	Firdale	Pt	Fs	Fs	Fs	Fa
FIR /1dxx	Firdale	Pt	Fs	Fs	Fs	Fa
FIR /2dxx	Firdale	Pt	Fs	Fs	Fs	Fa
FIR /xexx	Firdale	Vt	Fst	Fst	Fs	Fat
FIR /1exx	Firdale	Vt	Fst	Fst	Fs	Fat
FIR /2exx	Firdale	Vt	Fst	Fst	Fs	Fat
FIR /3exx	Firdale	Vt	Fst	Fst	Fs	Fat
FIR /2fxx	Firdale	Vt	Pt	Pt	Fst	Pt
FIR /3fxx	Firdale	Vt	Pt	Pt	Fst	Pt
FRS	Ferris	Fw	Fws	Fws	Fws	Fws
FSO	Fresno	Fw	Fws	Fws	Fws	Fws
FSO /xcxx	Fresno	Fwt	Fws	Fws	Fws	Fws
GRR	Guerra	Pw	Pw	Pw	Pw	Vh
GRRp	Guerra	Vw	Vw	Vw	Vw	Vaw
GRR /xxxs	Guerra	Pw	Pw	Pw	Pw	Vh
GRRp/xxxs	Guerra	Vw	Vw	Vw	Vw	Vwh
HIT /xcxx	Hilton	Fst	Fs	Fs	Fs	Fa
HIT /1cxx	Hilton	Fst	Fs	Fs	Fs	Fa

TABLE 10

Suitability Ratings and Limitations of Soils in the Study Area for Various Recreational Uses

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
HIT /xc1x	Hilton	Fst	Fs	Fs	Fs	Fa
HIT /xc2x	Hilton	Fst	Fs	Fsp	Fs	Fap
HIT /1c1x	Hilton	Fts	Fs	Fs	Fs	Fa
HIT /2c1x	Hilton	Fst	Fs	Fs	Fs	Fa
HIT /2c2x	Hilton	Fst	Fs	Fs	Fs	Fap
HIT /xdxx	Hilton	Pt	Fs	Fs	Fs	Fa
HIT /1dxx	Hilton	Pt	Fs	Fs	Fs	Fa
HIT /xd1x	Hilton	Pt	Fs	Fs	Fs	Fa
HIT /1d1x	Hilton	Pt	Fs	Fs	Fs	Fa
HIT /xd2x	Hilton	Pt	Fs	Fap	Fs	Fap
HIT /2d1x	Hilton	Pt	Fs	Fs	Fs	Fa
HIT /2d2x	Hilton	Pt	Fs	Fsp	Fs	Fap
HIT /3d2x	Hilton	Pt	Fst	Fsp	Fs	Fap
HIT /xe1x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT /1e1x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT /1e2x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT /2e2x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT /2e1x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT /2e3x	Hilton	Vt	Fst	Pp	Fsp	Pp
HIT /3e1x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT /3e2x	Hilton	Vt	Fst	Fst	Fs	Fat
HIT /2fxx	Hilton	Vt	Pt	Pt	Fst	Pt
HIT /2f1x	Hilton	Vt	Pt	Pt	Fst	Pt
HIT /2f2x	Hilton	Vt	Pt	Pt	Fst	Pt
HIT /3f1x	Hilton	Vt	Pt	Pt	Fst	Pt
HKS	Hickson	Pw	Pw	Pw	Pw	Pw
HKS /xxxs	Hickson	Pw	Pwn	Pwn	Pw	Pw
HKSp	Hickson	Vw	Vw	Vw	Vw	Vw
HKSp/xxxs	Hickson	Vw	Vw	Vw	Vw	Vw
HOS	Horose	Pw	Pw	Pw	Pw	Pw
JYL	Joyale	Fsw	Fsw	Fsw	Fsw	Faw
JYL /xxxs	Joyale	Pwn	Pwn	Pwn	Fsw	Faw
JYL /xx1x	Joyale	Fsw	Fsw	Fsw	Fsw	Faw
JYL /xcxx	Joyale	Fsw	Fsw	Fsw	Fsw	Faw
KIS	Kingsley	Fs	Fs	Fs	Fs	Fa
KIS /xcxx	Kingsley	Fst	Fs	Fs	Fs	Fa
KIS /1cxx	Kingsley	Fst	Fs	Fs	Fs	Fa
KUD	Knudson	Fs	Fs	Fs	Fs	Fa
KUD /xcxx	Knudson	Fst	Fs	Fs	Fs	Fa
KUD /ocxx	Knudson	Fst	Fs	Fs	Fs	Fa

TABLE 10

Suitability Ratings and Limitations of Soils in the Study Area for Various Recreational Uses

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
KUD /xclx	Knudson	Fs	Fs	Fs	Fs	Fa
KUD /xdxx	Knudson	Pt	Fs	Fs	Fs	Fa
LEI	Levine	Fis	Fis	Pi	Fsw	Pi
LRY	Leary	Vs	Pm	G	G	G
LRY /xcxx	Leary	Vs	Pm	G	G	G
LRY /1clx	Leary	Vs	Pm	G	G	G
LRY /1dlx	Leary	Vs	Pm	G	G	G
LRY /2d2x	Leary	Vs	Pm	Fp	G	Fp
LRY /xexx	Leary	Vs	Pm	Ft	G	Ft
LRY /1exx	Leary	Vts	Pm	Ft	G	Ft
LRY /xelx	Leary	Vts	Pm	Ft	G	Ft
LRY /1elx	Leary	Vts	Pm	Ft	G	Ft
LRY /2exx	Leary	Vts	Pm	Ft	G	Ft
LRY /3exx	Leary	Vts	Pm	Ft	G	Ft
LRY /xfxx	Leary	Vst	Ptm	Pt	Ft	Pt
LRY /1fxx	Leary	Vts	Ptm	Pt	Ft	Pt
LRY /2fxx	Leary	Vts	Ptm	Pt	Ft	Pt
LRY /3fxx	Leary	Vts	Pmt	Pt	Ft	Pt
LRY1	Leary	Vs	Pm	G	G	G
LRY1/xdxx	Leary	Vs	Pm	G	G	G
LRY1/xfxx	Leary	Vts	Ptm	Pt	Ft	Pt
MXS /xcxx	Manitou	Fs	Fs	Fs	Fs	Fa
MXS /xdxx	Manitou	Fs	Fs	Fs	Fs	Fa
NKK	Nikkel	Fw	Fws	Fws	Fws	Fwa
NKK /xxlx	Nikkel	Fws	Fsw	Fsw	Fsw	Faw
NSH	Narish	Pw	Pw	Pw	Pw	Pw
NYO /xcxx	Nayler	Fst	Fs	Fs	Fs	Fa
NYO /xdxx	Nayler	Pt	Fs	Fs	Fs	Fa
NYO /1dxx	Nayler	Pt	Fs	Fs	Fs	Fa
NYO /1dlx	Nayler	Pt	Fs	Fs	Fs	Fa
NYO /xexx	Nayler	Pt	Fs	Fst	Fs	Fat
NYO /1exx	Nayler	Pt	Fs	Fst	Fs	Fat
NYO /1elx	Nayler	Pt	Fs	Fst	Fs	Fat
NYO /2exx	Nayler	Pt	Fs	Fst	Fs	Fat
NYO /2elx	Nayler	Pt	Fs	Fst	Fs	Fat
NYO /3exx	Nayler	Pt	Fs	Fst	Fs	Fat
NYO /xfxx	Nayler	Pt	Pt	Pt	Fst	Pt
NYO /1fxx	Nayler	Pt	Pt	Pt	Fst	Pt
NYO /1flx	Nayler	Pt	Pt	Pt	Fst	Pt
NYO /2fxx	Nayler	Pt	Pt	Pt	Fst	Pt

TABLE 10

Suitability Ratings and Limitations of Soils in the Study Area for Various Recreational Uses

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
NYO /2f1x	Nayler	Pt	Pt	Pt	Fst	Pt
NYO /2f2x	Nayler	Pt	Pt	Pt	Fst	Pt
OIV /xxxs	Oliver	Ps	Pws	Psn	Pws	Ps
PBI	Pembina	Fs	Fs	Fs	Fs	Fa
PBI /xcxx	Pembina	Fst	Fs	Fs	Fs	Fa
PBI /1cxx	Pembina	Fst	Fs	Fs	Fs	Fa
PBI /1c1x	Pembina	Fst	Fs	Fs	Fs	Fs
PBI /1c2x	Pembina	Fpt	Fs	Fsp	Fs	Fap
PBI /2c1x	Pembina	Fst	Fs	Fs	Fs	Fa
PBI /xdxx	Pembina	Pt	Fs	Fs	Fs	Fa
PBI /1dxx	Pembina	Pt	Fs	Fs	Fs	Fa
PBI /1d1x	Pembina	Pt	Fs	Fs	Fs	Fa
PBI /xd1x	Pembina	Pt	Fs	Fs	Fs	Fa
PBI /1d2x	Pembina	Pt	Fs	Fsp	Fs	Fap
PBI /2d1x	Pembina	Pt	Fs	Fs	Fs	Fa
PBI /2e1x	Pembina	Vt	Fst	Fst	Fs	Fat
PBI /xexx	Pembina	Vt	Fst	Fst	Fs	Fat
PBI /1exx	Pembina	Vt	Fst	Fst	Fs	Fat
PBI /1e1x	Pembina	Vt	Fst	Fst	Fs	Fat
PBI /2exx	Pembina	Vt	Fst	Fst	Fs	Fat
PBI /1fxx	Pembina	Vt	Pt	Pt	Fst	Pt
PBI /2f1x	Pembina	Vt	Pt	Pt	Fst	Pt
PBI /3fxx	Pembina	Vt	Pt	Pt	Fst	Pt
PBI /3f1x	Pembina	Vt	Pt	Pt	Fst	Pt
PBI1/1c1x	Pembina	Fst	Fs	Fs	Fs	Fa
PBI1/xdxx	Pembina	Pt	Fs	Fs	Fs	Fa
PBI1/xd1x	Pembina	Pt	Fs	Fs	Fs	Fa
PBI1/1dxx	Pembina	Fs	Fs	Fs	Fs	Fa
PBI1/1e1x	Pembina	Pt	Fst	Fst	Fs	Fat
PBI1/2e1x	Pembina	Pt	Fst	Fst	Fs	Fat
PBI1/2exx	Pembina	Pt	Fst	Fst	Fs	Fat
PBI1/xfxx	Pembina	Vt	Pt	Pt	Fst	Pt
PBI1/2fxx	Pembina	Vt	Pt	Pt	Fst	Pt
PBI2/1d1x	Pembina	Pt	Fs	Fs	Fs	Fa
PDA	Prodan	Fsw	Fsw	Fsw	Fsw	Faw
PDA /xxxs	Prodan	Pwn	Pwn	Pwn	Fsw	Faw
PDA /xcxx	Prodan	Fst	Fsw	Fsw	Fsw	Faw
PER	Perillo	Vsw	Vsw	Vsw	Vsw	Va
PYR /xcxx	Poyser	Fst	Fs	Fs	Fs	Fa
PYR /1c1x	Poyser	Fst	Fs	Fs	Fs	Fa

TABLE 10

Suitability Ratings and Limitations of Soils in the Study Area for Various Recreational Uses

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
PYR /xdlx	Poyser	Pt	Fs	Fs	Fs	Fa
PYR /1dlx	Poyser	Pt	Fs	Fs	Fs	Fa
PYR /2elx	Poyser	Vt	Fst	Fst	Fs	Fat
PYR1/1exx	Poyser	Vt	Fst	Fst	Fs	Fat
PYR1/1fxx	Poyser	Vt	Pt	Pt	Fst	Pt
PYR1/2fxx	Poyser	Vt	Pt	Pt	Fst	Pt
PYR2/xcxx	Poyser	Fst	Fs	Fs	Fs	Fa
PYR2/1cxx	Poyser	Fst	Fs	Fs	Fs	Fa
PYR2/1clx	Poyser	Fst	Fs	Fs	Fs	Fa
PYR2/xdxx	Poyser	Pt	Fs	Fs	Fs	Fa
PYR2/1dxx	Poyser	Pt	Fs	Fs	Fs	Fa
PYR2/1dlx	Poyser	Pt	Fs	Fs	Fs	Fa
PYR2/2dlx	Poyser	Pt	Fs	Fs	Fs	Fa
PYR2/1e2x	Poyser	Vt	Fst	Fsp	Fs	Fat
RAM	Ramada	Fs	Fs	Fs	Fs	Fa
RAM /xcxx	Ramada	Fst	Fs	Fs	Fs	Fa
RAM /1cxx	Ramada	Fst	Fs	Fs	Fs	Fa
RAM /xdxx	Ramada	Pt	Fs	Fs	Fs	Fa
TDP	Tadpole	Pw	Pw	Pw	Pw	Pw
TDPp	Tadpole	Vw	Vw	Vw	Pw	Pw
TDP /xxxs	Tadpole	Pwn	Pwn	Pwn	Pw	Pw
TDP /xxxu	Tadpole	Vn	Vn	Vn	Pw	Pw
TGL /xcxx	Tiger Hills	Fst	Fs	Fs	Fs	Fa
TGL /1clx	Tiger Hills	Fst	Fs	Fs	Fs	Fa
TGL /xclx	Tiger Hills	Fst	Fs	Fs	Fs	Fa
TGL /2cxx	Tiger Hills	Fst	Fs	Fs	Fs	Fa
TGL /2clx	Tiger Hills	Fpt	Fs	Fs	Fs	Fa
TGL /3c2x	Tiger Hills	Fsp	Fs	Fsp	Fs	Fap
TGL /xdxx	Tiger Hills	Pt	Fs	Fs	Fs	Fa
TGL /xd3x	Tiger Hills	Ptp	Fsp	Pp	Fsp	Pp
TGL /1dlx	Tiger Hills	Pt	Fs	Fs	Fs	Fa
TGL /1elx	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL /1e2x	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL /1e3x	Tiger Hills	Vt	Fsp	Pp	Fsp	Pp
TGL /2exx	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL /2elx	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL /2e2x	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL /xfxx	Tiger Hills	Vt	Pt	Pt	Fst	Pt
TGL /1fxx	Tiger Hills	Vt	Pt	Pt	Fst	Pt
TGL /2flx	Tiger Hills	Vt	Pt	Pt	Fst	Pt

TABLE 10

Suitability Ratings and Limitations of Soils in the Study Area for Various Recreational Uses

Map Symbol and Phase	Soil Name	Play Ground	Picnic Area	Camp Area	Path And Trails	Permanent Bldgs. Without Basements
TGL /2f2x	Tiger Hills	Vt	Pt	Pt	Fst	Pt
TGL /3f2x	Tiger Hills	Vt	Pt	Pt	Fst	Pt
TGL /3f3x	Tiger Hills	Vt	Pt	Ptp	Fst	Ptp
TGL1/xdxx	Tiger Hills	Pt	Fs	Fs	Fs	Fa
TGL1/3d1x	Tiger Hills	Pt	Fs	Fs	Fs	Fa
TGL1/xexx	Tiger Hills	Vt	Fst	Fst	Fs	Fat
TGL1/2f1x	Tiger Hills	Vt	Pt	Pt	Fst	Pt
TLI	Tellier	Fsw	Fsw	Fsw	Fsw	Faw
TLI /xc1x	Tellier	Fsw	Fsw	Fsw	Fsw	Faw
TNT	Trinton	Fs	Fs	Fs	Fs	Fa
TNT /xcxx	Trinton	Fst	Fs	Fs	Fs	Fa
TNT /1c1x	Trinton	Fst	Fs	Fs	Fs	Fa
ULH	Ullrich	Fsw	Fsw	Fsw	Fsw	Faw
VDL	Vandal	Fsq	Fs	Fs	Fs	G
VDL /xcxx	Vandal	Fst	Fs	Fs	Fs	G
VDL /xc1x	Vandal	Fst	Fs	Fs	Fs	G
VDL /xdxx	Vandal	Pt	Fs	Fs	Fs	G
VDL /1dxx	Vandal	Vt	Fs	Fs	Fs	G
VDL /xexx	Vandal	Vt	Fst	Fst	Fs	Pt
VDL /1exx	Vandal	Vt	Fst	Fst	Fs	Ft
VDL /xe1x	Vandal	Vt	Fst	Fst	Fs	Ft
VDL /2exx	Vandal	Vt	Fst	Fst	Fs	Ft
VDL /3exx	Vandal	Vt	Fst	Fst	Fs	Ft
VDL /2fxx	Vandal	Vt	Pt	Pt	Fst	Pt
VDL /3fxx	Vandal	Vt	Pt	Pt	Fst	Pt
VDL1	Vandal	Fsq	Fs	Fs	Fs	G
VDL1/xcxx	Vandal	Fst	Fs	Fs	Fs	G
VDL1/1cxx	Vandal	Fst	Fs	Fs	Fs	G
VDL1/1dxx	Vandal	Pt	Fs	Fs	Fs	G
VDL1/1exx	Vandal	Vt	Fst	Fst	Fs	Ft
VDL1/2exx	Vandal	Vt	Fst	Fat	Fs	Ft
VDL1/1fxx	Vandal	Vt	Pt	Pt	Fst	Pt
VDL2/xcxx	Vandal	Fst	Fs	Fs	Fs	G
VDL2/1dxx	Vandal	Pt	Fs	Fs	Fs	G
VDL2/2dxx	Vandal	Pt	Fs	Fs	Fs	G
VDL2/2exx	Vandal	Vt	Fst	Fst	Fs	Ft
VTL	Vartel	Fsw	Fws	Fws	Fsw	Fw
VTL1	Vartel	Fsw	Fsw	Fsw	Fsw	Fw
XVI	Xavier	Vsw	Vsw	Vsw	Vsw	Vaw
ZPI	Zaplin	Fsw	Fws	Fsw	Fsw	Faw

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Appendix A

GLOSSARY

AASHO classification (soil engineering) - The official classification of soil materials and soil aggregate mixtures for highway construction used by the American Association of State Highway Officials.

Acid soil - A soil having a pH less than 7. See pH and Reaction, soil.

Alkaline soil - A soil having a pH greater than 7. See Reaction, soil.

Alluvium - A general term for all deposits of rivers and streams.

Arable soil - Soil suitable for plowing and cultivation.

Association - A sequence of soils of about the same age, derived from similar parent material, and occuring under similar climatic conditions but showing different characteristics due to variations in relief and in drainage.

1/3 Atmosphere Moisture - The moisture percentage on dry weight basis of a soil sample that has been air dried, screened, saturated and subjected to a soil moisture tension of 345 cm of water through a permeable membrane for a period of 48 hours. It approximates the soil moisture retention capacity.

Available nutrient - That portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants.

Available soil moisture - The portion of water in a soil that can be readily absorbed by plant roots: generally considered to be that water held in the soil up to approximately 15 atmospheres pressure.

Bearing capacity - Capacity of soil (in moist to wet conditions) to support loads such as buildings, people, vehicles, and animals.

Bedrock - The solid rock that underlies soil and regolith or that is exposed at the surface.

Boulders - Stones which are larger than 60 cm in diameter.

Bulk density - The weight of oven dry soil (105 degrees C) divided by its volume at field moisture conditions, expressed in grams per cubic centimeter.

Buried soil - Soil covered by an alluvial, loessial, or other deposit, usually to a depth greater than the thickness of the solum.

Calcareous soil - Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with hydrochloric acid.

Calcium Carbonate Equivalent - Refers to the percent of carbonates in the soil expressed on the basis of calcium carbonate. Terms used to express the carbonate contents of soils are:

noncalcareous	<1%
weakly calcareous	1-5%
moderately calcareous	6-15%
strongly calcareous	16-25%
v. strongly calcareous	26-40%
extremely calcareous	>40%

Capillary fringe - A zone of essentially saturated soil just above the water table. The size distribution of the pores determines the extent and degree of the capillary fringe.

Carbon-nitrogen ratio (C/N ratio) - The ratio of the weight of organic carbon to the weight of total nitrogen in a soil or in an organic material.

Cation Exchange Capacity (CEC) - A measure of the total amount of exchangeable cations that can be held by a soil. Expressed in millieguivalents per 100g of soil.

Clay - As a soil separate, the mineral soil particles less than 0.002 mm in diameter: usually consisting largely of clay minerals. As a soil textural class, soil materials that contain 40 or more percent clay, less than 45 percent sand and less than 40 percent silt.

Cobbles - Rock fragments 8 to 25 cm in diameter.

Color - Soil colors are compared with a Munsell color chart. The Munsell system specifies the relative degrees of the three simple variables of color: hue, value and chroma. For example: 10YR 6/4 means a hue of 10YR, a value of 6, and a chroma of 4.

Complex (soil) - A mapping unit used in detailed and reconnaissance soil surveys where two or more soil series that are so intimately intermixed in an area that it is impractical to separate them at the scale of mapping used.

Concretions - Hard grains, pellets or nodules from concentration of compounds in the soil that cement soil grains together.

Conductivity, electrical - A physical quantity that measures the readiness with which a medium (irrigation water and soil extracts) transmits electricity. It expresses the concentration of salt in terms of the conductance (reciprocal of the electric resistance in ohms) in millisiemens per cm.

Consistence (soil) - The mutual attraction of the particles in a soil mass, or their resistance to separation or deformation. It is described in terms such as loose, soft, friable, firm, hard, sticky, plastic or cemented.

Consumptive use factor (CU) - The ratio of consumptive use of water by a crop to potential evapotranspiration. and transpiration. An actively growing crop that completely covers the soil over a large area and that has an ample supply of readily available soil water has a consumptive use factor of 1.0.

Consumptive use of water - The sum of the depths of water transpired by the plants and evaporated from the soil surface and from intercepted precipitation. It may be less or greater than potential evapotranspiration.

Contour - An imaginary line connecting points of equal elevation on the surface of the soil.

Cover - This term generally has one of the following meanings:

1. Vegetation or other material providing protection
2. In forestry, low growing shrubs and herbaceous plants under trees (i.e., ground cover vs. tree cover)
3. Any vegetation producing a protective mat on or just above the soil surface.

Creep (soil) - Slow mass movement of soil and soil material down rather steep slopes primarily under the influence of gravity, but aided by saturation with water and by alternate freezing and thawing.

Decile portion - A one-tenth portion. As used in the soil map symbol A7-B3 means that the A soils cover seven tenths and the B soils cover three tenths of the map unit.

Delta - A fluvial or glaciofluvial fan shaped deposit at the mouth of a river that empties into a lake or sea.

Deflocculate - To separate or to break up soil aggregates into individual particles by chemical or physical means or both.

Degradation (of soils) - The changing of a soil to a more highly leached and more highly weathered condition, usually accompanied by morphological changes such as the development of an eluviated light colored (Ae) horizon.

Dispersion - Is rated high, moderate or low depending on how readily the soil structure breaks down or slakes because of excess moisture. A rating of high indicates that soil aggregates slake readily; a rating of low indicates that aggregates are resistant to dispersion and remain clumped together.

Drainage (soil) - (1) The rapidity and extent of the removal of water from the soil by runoff and flow through the soil to underground spaces. (2) As a condition of the soil, it refers to the frequency and duration of periods when the soil is free of saturation.

Drainage in soil reports is described on the basis of actual moisture content in excess of field capacity and length of the saturation period within the plant root zone. The terms are as follows:

Very rapidly drained - Water is removed from the soil very rapidly in relation to supply. Excess water flows downward very rapidly if underlying material is pervious. There may be very rapid subsurface flow during heavy rainfall provided there is a steep gradient. Soils have very low available water storage capacity (usually less than 2.5 cm) within the control section and are usually coarse in texture, or shallow, or both. Water source is precipitation.

Rapidly drained - Water is removed from the soil rapidly in relation to supply. Excess water flows downward if underlying material is pervious. Subsurface flow may occur on steep gradients during heavy rainfall. Soils have low available water storage capacity (2.5-4 cm) within the control section, and are usually coarse in texture, or shallow, or both. Water source is precipitation.

Well drained - Water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying pervious material or laterally as subsurface flow. Soils have intermediate available water storage capacity (4-5 cm) within the control section, and are generally intermediate in texture and depth. Water source is precipitation. On slopes subsurface flow may occur for short durations but additions are equaled by losses. These soils are usually free of mottles within 100 cm of the surface but may be mottled below this depth. Soil horizons are usually bright colored.

Moderately well drained - Water is removed from the soil somewhat slowly in relation to supply. Excess water is removed somewhat slowly due to low perviousness, shallow water table, lack of gradient, or some combination of these. Soils have intermediate to high water storage capacity (5-6cm) within the control section and are usually medium to fine in texture. Soils are commonly mottled in the 50 to 100 cm depth. Colors are dull brown in the subsoil with stains and mottles.

Imperfectly drained - Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season. Excess water moves slowly downward if precipitation is major supply. If subsurface water or groundwater, or both, is the main source, flow rate may vary but the soil remains wet for a significant part of the growing season. Precipitation is the main source if available water storage capacity is high; contribution by subsurface flow or groundwater flow, or both, increases as available water storage capacity decreases. Soils have a wide range in available water supply, texture, and depth, and are gleyed phases of well drained subgroups. These soils generally have mottling below the surface layers and generally have duller colors with depth, generally brownish gray with mottles of yellow and gray.

Poorly drained - Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or groundwater flow, or both, in addition to precipitation are main water sources; there may also be a perched water table, with precipitation exceeding evapotranspiration. Poorly drained soils have a wide range in available water storage capacity, texture, and depth, and are gleyed subgroups, Gleysols, and Organic soils.

Very poorly drained - Water is removed from the soil so slowly that the water table remains at or on the surface for the greater part of the time the soil is not frozen. Excess water is present in the soil for the greater part of the time. Groundwater flow and subsurface flow are major water sources. Precipitation is less important except where there is a perched water table with precipitation exceeding evapotranspiration. These soils have a wide range in available water storage capacity, texture, and depth, and are either Gleysolic or Organic.

Dryland farming - The practice of crop production in low rainfall areas without irrigation.

Eluvial horizon - A horizon from which material has been removed in solution or in water suspension.

Eolian - Soil material accumulated through wind action.

Erosion - The wearing away of the land surface by detachment and transport of soil and rock material through the action of moving water, wind or other geological processes. The ratings of erosion are:

Erosion 1	slightly eroded - soil with a sufficient amount of the A horizon removed that ordinary tillage will bring up and mix the B horizon or other lower lying horizons with surface soil in the plow layer.
Erosion 2	moderately eroded - soil with all of the A horizon and a part of the B or other lower lying horizons removed. The plow layer consists mainly of the original horizons below the A or below the original plow layer.
Erosion 3	severely eroded - soils have practically all of the original surface soil removed. The plow layer consists mainly of C horizon material, especially on knolls and steep upper slope positions.

Evapotranspiration - The combined loss of water from a given area, and during a specific period of time, by evaporation from the soil surface and transpiration from plants.

Field Moisture Equivalent - The minimum moisture content at which a drop of water placed on a smoothed surface of the soil will not be absorbed immediately by the soil, but will spread out over the surface and give it a shiny appearance.

Flood plain - The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

Fluvial deposits - All sediments past and present, deposited by flowing water, including glaciofluvial deposits.

Frost heave - The raising of the surface caused by ice in the subsoil.

Friable - Soil aggregates that are soft and easily crushed between thumb and forefinger.

Glaciofluvial deposits - Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. These deposits are stratified and may occur in the form of outwash plains, deltas, kames, eskers and kame terraces.

Gleyed soil - An imperfectly or poorly drained soil in which the material has been modified by reduction or alternating reduction and oxidation. These soils have lower chromas or more prominent mottling or both in some horizons than the associated well-drained soil.

Gleysolic - An order of soils developed under wet conditions and permanent or periodic reduction. These soils have low chromas or prominent mottling or both, in some horizons.

Gravel - Rock fragments 2 mm to 7.5 cm in diameter.

Ground Moraine - An unsorted mixture of rocks, boulders, sand, silt and clay deposited by glacial ice. The predominant material is till; most till is thought to have accumulated under the ice by lodgment, but some till has been let down from the upper surface of the ice by ablation. Resorting and modification may have taken place to some extent by wave-action of glacial melt waters. The topography is most commonly in the form of undulating plains with gently sloping hills and enclosed depressions.

Groundwater - Water beneath the soil surface, usually under conditions where the voids are completely filled with water (saturation).

Halophytic vegetation - vegetation that grows naturally in soils having a high content of various salts. It usually has fleshy leaves or thorns and resembles desert vegetation.

Horizon (soil) - A layer in the soil profile approximately parallel to the land surface with more or less well-defined characteristics that have been produced through the operation of soil forming processes.

Horizon boundary - The lower boundary of each horizon is described by indicating its distinctness and form. The distinctness depends on the abruptness of vertical change (thickness). The form refers to the variation of the boundary plane.

Distinctness -
abrupt - less than 2 cm
clear - 2 to 5 cm
gradual - 5 to 15 cm
diffuse - more than 15 cm

Form -
smooth - nearly plain
wavy - pockets are wider than deep
irregular - pockets are deeper than wide
broken - parts of the horizon are unconnected with other parts

Humic layer - A layer of highly decomposed organic soil material containing little fibre.

Hydraulic Conductivity - Refers to the effective flow velocity or discharge velocity in soil at unit hydraulic gradient. It is an approximation of the permeability of the soil and is expressed in cm per hour. The classes are described in general or specific terms as:

High	>15	Very rapid	>50
		Rapid	15-50
Medium	0.5-15	Mod. rapid	5.0-15
		Moderate	1.5-5.0
		Mod. slow	0.5-1.5
Low	<0.5	Slow	0.15-0.5
		Very slow	0.015-0.15
		Extremely slow	<.015

Hydrologic cycle - The conditions through which water naturally passes from the time of precipitation until it is returned to the atmosphere by evaporation and is again ready to be precipitated.

Hydrophyte - Plants growing in water or dependent upon wet or saturated soil conditions for growth.

Illuvial horizon - A soil horizon in which material carried from an overlying layer has been precipitated from solution or deposited from suspension. The layer of accumulation.

Impeded drainage - A condition that hinders the movement of water by gravity through the soils.

Inclusion - Soil type found within a mapping unit that is not extensive enough to be mapped separately or as part of a complex.

Infiltration - The downward entry of water into the soil

Irrigation - The artificial application of water to the soil for the benefit of growing crops.

Irrigation requirement (IR) - Refers to the amount of water exclusive of effective precipitation that is required for crop production.

Lacustrine deposits - Material deposited by or settled out of lake waters and exposed by lowering of the water levels or elevation of the land. These sediments range in texture from sand to clay and are usually varved (layered annual deposits).

Landforms - See Description of Landforms

Landscape - All the natural features such as fields, hills, forest, water, etc., which distinguish one part of the earth's surface from another part.

Leaching - The removal from the soil of materials in solution.

Liquid limit (upper plastic limit) - The water content corresponding to an arbitrary limit between the liquid and plastic states of consistency of a soil. The water content at this boundary is defined as that at which a pat of soil cut by a groove of standard dimensions will flow together for a distance of 1.25 cm under the impact of 25 blows in a standard liquid limit apparatus.

Lineal shrinkage - This is the decrease in one dimension expressed as a percentage of the original dimension of the soil mass when the moisture content is reduced from a stipulated percentage (usually field moisture equivalent) to the shrinkage limit.

Mapping Unit - Any delineated area shown on a soil map that is identified by a symbol. A mapping unit may be a soil unit, a miscellaneous land type, or a soil complex.

Marsh - Periodically flooded or continually wet areas having the surface not deeply submerged. It is covered dominantly with sedges, cattails, rushes or other hydrophytic plants.

Mature soil - A soil having well-developed soil horizons produced by the natural processes of soil formation.

Mesophyte - Plants requiring intermediate moisture conditions and are not very resistant to drought.

Microrelief - Small-scale, local differences in relief including mounds, swales or hollows.

Milliequivalent (me) - One-thousandth of an equivalent. An equivalent is the weight in grams of an ion or compound that combines with or replaces one gram of hydrogen. The atomic or formula weight divided by valence.

Mottles - Irregularly marked spots or streaks, usually yellow or orange but sometimes blue. They are described in order of abundance (few, common, many), size (fine, medium, coarse) and contrast (faint, distinct, prominent). Mottles in soils indicate poor aeration and lack of good drainage.

Organic carbon - Carbon derived from plant and animal residues.

Organic matter - The fraction of the soil which consists of plant and animal residues at various stages of decomposition, cells and tissues of soil organisms and substances synthesized by the soil population. It is determined on soils that have been sieved through a 2.0 mm sieve. It is estimated by multiplying the organic carbon by a factor of 1.72.

Outwash - Sediments "washed out" beyond the glacier by flowing water and laid down in thin beds or strata. Particle size may range from boulders to silt.

Ovendry soil - Soil that has been dried at 105 degrees C until it has reached constant weight.

Parent material - The unaltered or essentially unaltered mineral or organic material from which the soil profile develops by pedogenic processes.

Particle size, soil - The grain size distribution of the whole soil including the coarse fraction. It differs from texture, which refers to the fine earth (less than 2mm) fraction only. In addition, textural classes are usually assigned to specific horizons whereas soil family particle-size classes indicate a composite particle size of a part of the control section that may include several horizons. See Textural Triangle at end of Glossary.

The particle-size classes for family groupings are as follows:

Fragmental Stones, cobbles and gravel, with too little fine earth to fill interstices larger than 1 mm.

Sandy-skeletal Particles coarser than 2 mm occupy 35% or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the sandy particle-size class.

Loamy-skeletal Particles 2 mm-25 cm occupy 35% or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the loamy particle-size class.

Clayey-skeletal Particles 2 mm-25 cm occupy 35% or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the clayey particle-size class.

Sandy The texture of the fine earth includes sands and loamy sands, exclusive of loamy very fine sand and very fine sand textures; particles 2 mm- 25 cm occupy less than 35% by volume.

Loamy The texture of the fine earth includes loamy very fine sand, very fine sand, and finer textures with less than 35% clay; particles 2 mm-25 cm occupy less than 35% by volume.

Coarse-loamy. A loamy particle size that has 15% or more by weight of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has less than 18% clay in the fine earth fraction.

Fine-loamy. A loamy particle size that has 15% or more by weight of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has 18-35% clay in the fine earth fraction.

Coarse-silty. A loamy particle size that has less than 15% of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has less than 18% clay in the fine earth fraction.

Fine-silty. A loamy particle size that has less than 15% of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has 18-35% clay in the fine earth fraction.

Clayey. The fine earth contains 35% or more clay by weight and particles 2mm-25 cm occupy less than 35% by volume.

Fine-clayey. A clayey particle size that has 35-60% clay in the fine earth fraction.

Very-fine-clayey. A clayey particle size that has 60% or more clay in the fine earth fraction.

Ped - An individual soil aggregate such as granule, prism or block formed by natural processes (in contrast with a clod which is formed artificially).

Pedology - Those aspects of soil science involving constitution, distribution, genesis and classification of soils.

Percolation - The downward movement of water through soil; specifically, the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of 1.0 or less.

Permafrost -

1. Perennially frozen material underlying the solum.
2. A perennially frozen soil horizon.

Permafrost table - The upper boundary of permafrost, usually coincident with the lower limit of seasonal thaw (active layer).

Permeability - The ease with which water and air pass through the soil to all parts of the profile. See hydraulic conductivity.

pH - The intensity of acidity and alkalinity, expressed as the negative logarithm of the hydrogen ion concentration. A pH of 7 is neutral, lower values indicate acidity and higher values alkalinity (see Reaction, soil).

Phase, soil - A soil phase is used to characterize soil and landscape properties that are not used as criteria in soil taxonomy. The major phase differentiae are: slope, erosion, deposition, stoniness, texture, salinity, and calcareousness.

Plastic Limit - The water content corresponding to an arbitrary limit between the plastic and the semisolid states of consistency of a soil.

Plasticity Index - The numerical difference between the liquid and the plastic limit. The plasticity index gives the range of moisture contents within which a soil exhibits plastic properties.

Potential evapotranspiration (PE) - The maximum quantity of water capable of being lost as water vapor, in a given climate, by a continuous stretch of vegetation covering the whole ground and well supplied with water.

Profile, soil - A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil - The acidity or alkalinity of a soil. Soil reaction classes are characterized as follows:

extremely acid	pH <4.5
very strongly acid	4.5 to 5.0
strongly acid	5.1 to 5.5
medium acid	5.6 to 6.0
slightly acid	6.1 to 6.5
neutral	6.6 to 7.3
mildly alkaline	7.4 to 7.8
mod. alkaline	7.9 to 8.4
strongly alkaline	8.5 to 9.0
very strongly alkaline	>9.0

Regolith - The unconsolidated mantle of weathered rock and soil material on the earth's surface.

Relief - The elevation of inequalities of the land surface when considered collectively.

Runoff - The portion of the total precipitation on an area that flows away through stream channels. Surface runoff does not enter the soil. Groundwater runoff or seepage flow from groundwater enters the soil before reaching the stream.

Saline Soil - A nonalkali soil containing soluble salts in such quantities that they interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 millisiemens/cm (ms/cm), the exchangeable-sodium percentage is less than 15, and the pH is usually less than 8.5. Approximate limits of salinity classes are:

non-saline	0 to 4 ms/cm
weakly saline	4 to 8 mS/cm
mod. saline	8 to 15 ms/cm
strongly saline	>15 ms/cm

Salinization - The process of accumulation of salts in the soil.

Salt-Affected Soil - Soil that has been adversely modified for the growth of most crop plants by the presence of certain types of exchangeable ions or of soluble salts. It includes soils having an excess of salts, or an excess of exchangeable sodium or both.

Sand - A soil particle between 0.05 and 2.0 mm in diameter. The textural class name for any soil containing 85 percent or more of sand and not more than 10 percent of clay.

Saturation Percentage - The moisture percentage of a saturated soil paste, expressed on an oven dry weight basis.

Seepage -

1. The escape of water downward through the soil.

2. The emergence of water from the soil along an extensive line of surface in contrast to a spring where water emerges from a local spot.

Series, soil - A category in the Canadian System of Soil Classification. It consists of soils that have soil horizons similar in their differentiating characteristics and arrangement in the profile, except for surface texture and are formed from a particular type of parent material.

Shrinkage limit - This is the moisture content at which an equilibrium condition of volume change is reached and further reduction in moisture content will not cause a decrease in the volume of the soil mass.

Shrinkage ratio - This is the ratio between the volume change and a corresponding change in moisture content. It equals the apparent specific gravity of the dried soil.

Silt - (a) Individual mineral particles of soil that range in diameter between 0.05 to .002 mm. (b) Soil of the textural class silt contains greater than 80 percent silt and less than 12 percent clay.

Slickenside - Smoothed surfaces along planes of weakness resulting from the movement of one mass of soil against another in soils dominated by swelling clays.

Sodium-Adsorption Ratio (S.A.R.) - A ratio for soil extracts and irrigation waters used to express the relative activity of sodium ions in exchange reactions with other cations in the soil SAR = $Na/((Ca+Mg)/2)^{1/2}$ where the cation concentrations are expressed as milliequivalents per litre.

Soil - The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. Soil has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including moisture and temperature effects), macro- and microorganisms, and topography, all acting over a period of time.

Solum - The upper horizons of a soil above the parent material and in which the processes of soil formation are active. It usually comprises the A and B horizons.

Stones - Rock fragments greater than 25 cm in diameter.

Stoniness - The percentage of land surface occupied by stones. The classes of stoniness are defined as follows:

Stones 0. Nonstony -- Land having less than 0.01% of surface occupied by stones.

Stones 1. Slightly stony -- Land having 0.01-0.1% of surface occupied by stones. Stones 15-30 cm in diameter, 10-30 m apart. The stones offer only slight to no hindrance to cultivation.

Stones 2. Moderately stony -- Land having 0.1-3% of surface occupied by stones. Stones 15-30 cm in diameter, 2-10 m apart. Stones cause some interference with cultivation.

Stones 3. Very stony -- Land having 3-15% of surface occupied by stones. Stones 15-30 cm in diameter, 1-2 m apart. There are sufficient stones to constitute a serious handicap to cultivation.

Stones 4. Exceedingly stony -- Land having 15-50% of surface occupied by stones. Stones 15-30 cm in diameter, 0.7-1.5 m apart. There are sufficient stones to prevent cultivation until considerable clearing has been done.

Stones 5. Excessively stony -- Land having more than 50% of surface occupied by stones. Stones 15-30 cm in diameter, less than 0.7 m apart. The land is too stony to permit cultivation.

Storage Capacity - Refers to the maximum amount of readily available water that can be stored within the rooting zone of a crop in a given soil. For practical irrigation purposes, 50 percent of the total soil water between field capacity and wilting point may be considered as readily available.

Stratified materials - Unconsolidated sand, silt and clay arranged in strata or layers. In stratified materials, a bed is a unit layer distinctly separable from other layers and is one or more cm thick but a lamina is a similar layer less than 1 cm thick.

Structure - The combination or arrangement of primary soil particles into aggregates of secondary soil particles, units or peds, which are separated from each other by surfaces of weakness. Structure is expressed in terms of grade, size class and shape type. Grade refers to the distinctness of aggregate development, and is described as structureless, weak, moderate or strong. Structureless refers to the absence of observable aggregation of definite orderly arrangement; the term amorphous is used if soil is massive or coherent, single-grained if noncoherent. The weak to strong aggregates vary in size and are described by class as fine, medium, coarse, and very coarse depending on the shape types. The shape types refers to the dominant configuration of the aggregates and the way they are accommodated. The general shape types are plate-like, block-like and prism-like. The terms are:

Platy - Having thin, plate-like aggregates with faces mostly horizontal

Prismatic - Having prism-like aggregates with tops and edges, appear plane, level and somewhat angular.

Columnar - Having prism-like aggregates with vertical edges near the top of columns, not sharp.

Granular - Having block-like aggregates that appear as spheroids or polyhedrons having plane or curved surfaces which have slight or no accommodation to the faces of the surrounding peds.

Blocky - Having block-like aggregates with sharp, angular corners

Subangular blocky - Having block-like aggregates with rounded and flattened faces and rounded corners.

By convention an aggregate is described in the order of grade, class and type, e.g. strong, medium, blocky. In the parent material of soils the material with structural shapes may be designated as pseudo-blocky, pseudo-platy, etc.

Soil Survey - The systematic examination, description, classification, and mapping of soil in an area.

Sulfate Hazard - Refers to the relative degree of attack on concrete by soil and water containing various amounts of sulfate ions. It is estimated from electrolyte measurements and salt analysis on selected profiles and soil samples, and by visual examination of free gypsum within the profile during the course of soil investigation.

Swamp - See Description of Landforms

Texture, soil - The relative proportions of the fine earth (less than 2 mm.) fraction of a soil. Textural classes are usually assigned to specific horizons whereas family particle size classes indicate a composite particle size of a portion of the control section that may include several horizons. See Texture Triangle at end of Glossary.

The size range of the constituent primary particles are as follows:

	Diameter (mm)
Very coarse sand. . . .	2.0-1.0
Coarse sand	1.0-0.5
Medium sand	0.5-0.25
Fine sand	0.25-0.10
Very fine sand. . . .	0.10-0.05
Silt.	0.05-0.002
Clay.	< 0.002
Fine clay	< 0.0002

Till, glacial - Unstratified glacial deposits consisting of clay, sand, gravel, and boulders intermingled in any proportion.

Tilth - The physical condition of soil as related to its ease of tillage, fitness as a seedbed, and its impedance to seedling emergency and root penetration.

Topography - Refers to the percent slope and the pattern or frequency of slopes in different directions. A set of 10 slope classes are used to denote the dominant but not necessarily most abundant slopes within a mapping unit.

Slope Class	Slope Name	Percent slope	Approx. degrees
1	level	0-0.5	0
2	nearly level	.5-2.5	.3-1.5
3	very gentle	2-5	1-3
4	gentle	6-9	3.5-5
5	moderate	10-15	6-8.5
6	strong	16-30	9-17
7	very strong	31-45	17-24
8	extreme	46-70	25-35
9	steep	71-100	35-45
10	very steep	>100	>45

Underground runoff - (or seepage)-Water flowing towards stream channels after infiltration into the ground.

Unified Soil Classification System (engineering) - A classification system based on the identification of soils according to their particle size, gradation, plasticity index and liquid limit.

Urban Land - Areas so altered or obstructed by urban works or structures that identification of soils is not feasible.

Variant, soil - A soil whose properties are believed to be sufficiently different from other known soils to justify a new series name, but comprising such a limited geographic area that creation of a new series is not justified.

Varve - A distinct band representing the annual deposit in sedimentary materials regardless of origin and usually consisting of two layers, one thick light colored layer of silt and fine sand laid down in the spring and summer, and the other a thin, dark colored layer of clay laid down in the fall and winter.

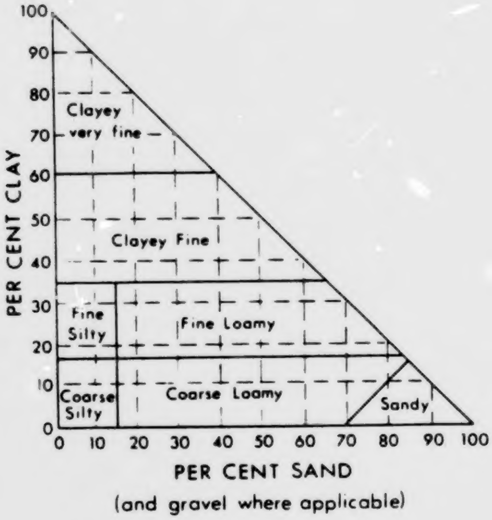
Water balance, soil - Is the daily amount of readily available water retained by the soil. The daily soil-water balance is decreased by the amount that the daily consumptive use exceeds the daily rainfall. When daily rainfall exceeds the consumptive use, the daily balance increases by the amount of the difference unless the soil-water balance is at storage capacity, in which case the excess is assumed to be lost by runoff or deep percolation.

Water table - (groundwater surface; free water surface; groundwater elevation) Elevation at which the pressure in the water is zero with respect to the atmospheric pressure.

Water-holding capacity - The ability of a soil to hold water against the force of gravity in a freely drained soil.

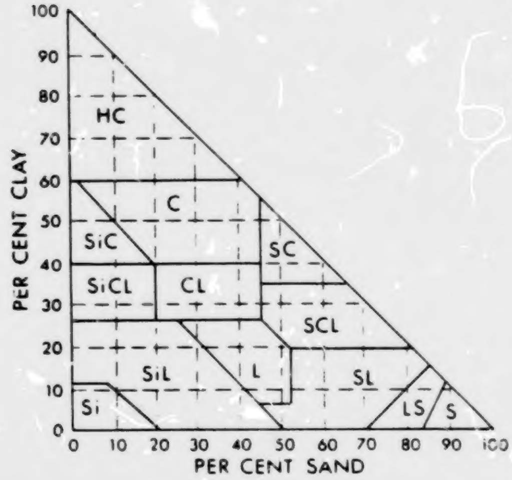
Weathering - The physical and chemical disintegration, alteration and decomposition of rocks and minerals at or near the earth's surface by atmospheric agents.

Xerophyte - Plants capable of surviving extended periods of soil drought.



Clayey very fine
Clayey Fine
Fine Silty
Fine Loamy
Coarse Silty
Coarse Loamy
Sandy
PER CENT CLAY
0
10
20
30
40
50
60
70
80
90
100
PER CENT SAND
(and gravel where applicable)

Figure 6: Family particle-size classes.



HC
C
SiC
SC
SiCL
CL
SCL
SiL
L
SL
Si
LS
S
PER CENT CLAY
0
10
20
30
40
50
60
70
80
90
100
PER CENT SAND

Texture Group	Class Symbol	Class Name
Coarse	S	sand
	LS	loamy sand
Moderately coarse	SL	sandy loam
	LVFS	loamy very fine sand
Medium	Si	silt
	SiL	silt loam
	L	loam
	VFSL	very fine sandy loam
Moderately fine	SCL	sandy clay loam
	CL	clay loam
	SiCL	silty clay loam
Fine	SC	sandy clay
	C	clay
	SiC	silty clay
Very fine	HC	heavy clay

Figure 7: Soil Textural Classes.

Appendix B

SOIL HORIZON DESIGNATIONS

ORGANIC HORIZONS

Organic horizons are found in Organic soils, and commonly at the surface of mineral soils. They may occur at any depth beneath the surface in buried soils, or overlying geologic deposits. They contain more than 17% organic carbon (approximately 30% organic matter) by weight. Two groups of these horizons are recognized, O horizons and the L, F, and H horizons.

O This is an organic horizon developed mainly from mosses, rushes, and woody materials.

Of The fibric horizon is the least decomposed of all the organic soil materials. It has large amounts of well-preserved fiber that are readily identifiable as to botanical origin. A fibric horizon has 40% or more of rubbed fiber by volume and a pyrophosphate index of 5 or more. If the rubbed fiber volume is 75% or more, the pyrophosphate criterion does not apply.

Om The mesic horizon is the intermediate stage of decomposition with intermediate amounts of fiber, bulk density and water-holding capacity. The material is partly altered both physically and biochemically. A mesic horizon is one that fails to meet the requirements of fibric or humic.

Oh The humic horizon is the most highly decomposed of the organic soil materials. It has the least amount of fiber, the highest bulk density, and the lowest saturated water-holding capacity. It is very stable and changes very little physically or chemically with time unless it is drained. The humic horizon has less than 10% rubbed fiber by volume and a pyrophosphate index of 3 or less.

LFH These organic horizons developed primarily from leaves, twigs, woody materials and a minor component of mosses under imperfectly to well drained forest conditions.

L This is an organic horizon characterized by an accumulation of organic matter in which the original structures are easily discernible.

F This is an organic horizon characterized by an accumulation of partly decomposed organic matter. The original structures in part are difficult to recognize. The horizon may be partly comminuted by soil fauna as in moder, or it may be a partly decomposed mat permeated by fungal hyphae as in mor.

H This is an organic horizon

characterized by an accumulation of decomposed organic matter in which the original structures are indiscernible. This material differs from the F horizon by its greater humification chiefly through the action of organisms. It is frequently intermixed with mineral grains, especially near the junction with the mineral horizon.

MASTER MINERAL HORIZONS

Mineral horizons are those that contain less than 30% organic matter by weight as specified for organic horizons.

A This is a mineral horizon or horizons formed at or near the surface in the zone of leaching or removal of materials in solution and suspension or of maximum in situ accumulation of organic matter, or both. Included are:

1. horizons in which organic matter has accumulated as a result of biological activity (Ah);
2. horizons that have been eluviated of clay, iron, aluminum, or organic matter, or all of them (Ae);
3. horizons having characteristics of 1) and 2) above but transitional to underlying B or C (AB or A and B);
4. horizons markedly disturbed by cultivation or pasture (Ap).

B This is a mineral horizon or horizons characterized by one or more of the following:

1. an enrichment in silicate clay, iron, aluminum, or humus, alone or in combination (Bt,Bf,Bfh,Bhf, and Bh);
2. a prismatic or columnar structure that exhibits pronounced coatings or stainings and significant amount of exchangeable Na (Bn);
3. an alteration by hydrolysis, reduction, or oxidation to give a change in color or structure from horizons above or below, or both, and does not meet the requirements of 1) and 2) above (Bm,Bg).

C This is a mineral horizon or horizons comparatively unaffected by the pedogenic processes operative in A and B, excepting (i) the process of gleying, and (ii) the accumulation of calcium and magnesium carbonates and more soluble salts (Cca,Csa,Cg, and C). Marl and diatomaceous earth are considered to be C horizons.

R This is consolidated bedrock that is too hard to break with the hands or to dig with a spade when moist and that does not meet the requirement of a C horizon. The boundary between the R layer and overlying unconsolidated material is called a lithic contact.

W This is a layer of water in Gleysolic, Organic, or Cryosolic soils. It is called a hydric layer in Organic soils.

LOWER-CASE SUFFIXES

b Buried soil horizon.

c A cemented (irreversible) pedogenic horizon. The ortstein of a Podzol, and a layer cemented by calcium carbonate and a duripan are examples.

ca A horizon with secondary carbonate enrichment where the concentration of lime exceeds that present in the unenriched parent material. It is more than 10 cm thick, and if it has a CaCO3 equivalent of less than 15 percent it should have at least 5 percent more CaCO3 equivalent than the parent material (IC). If it has more than 15 percent CaCO3 equivalent it should have 1/3 more CaCO3 equivalent than the IC. If no IC is present, this horizon is more than 10 cm thick and contains more than 5 percent by volume of secondary carbonates in concretions or soft, powdery forms.

cc Cemented (irreversible) pedogenic concretions.

e A horizon characterized by the eluviation of clay, iron, aluminum, or organic matter alone or in combination. When dry, it is usually higher in color value by 1 or more units than an underlying B horizon. It is used with A (Ae).

f A horizon enriched with amorphous material, principally Al and Fe combined with organic matter. It usually has a hue of 7.5YR or redder or its hue is 10YR near the upper boundary and becomes yellower with depth. When moist, the chroma is higher than 3 or the value is 3 or less. It contains 0.6% or more pyrophosphate-extractable Al+Fe in textures finer than sand and 0.4% or more in sands (coarse sand, sand, fine sand, and very fine sand). The ratio of pyrophosphate-extractable Al+Fe to clay (less than 0.002mm) is more than 0.05 and organic C exceeds 0.5%. Pyrophosphate-extractable Fe is at least 0.3%, or the ratio of organic C to pyrophosphate-extractable Fe is less than 20, or both are true. It is used with B alone (Bf), with B and h (Bhf), with B and g (Bfg), and with other suffixes. The criteria for "f" do not apply to Bgf horizons. The following horizons are differentiated on the basis of organic carbon content: Bf - 0.5% to 5% organic carbon. Bhf- more than 5% organic carbon.

g A horizon characterized by gray colors, or prominent mottling, or both, indicative of permanent or periodic intense reduction. Chromas of the matrix are generally 1 or less. It is used with A and e (Aeg); with B alone (Bg); with B and f (Bfg); with B, h, and f (Bhfg); with B and t (Btg); with C alone (Cg); with C and k (Ckg); and several others. In some reddish parent materials, matrix colors of reddish hues and high chromas may persist despite long periods of reduction. In these soils, horizons are designated as g if there is gray mottling or if there is marked bleaching on ped faces or along cracks.

  Aeg This horizon must meet the definitions of A,e, and g.

  Bg These horizons are analogous to Bm horizons but they have colors indicative of poor drainage and periodic reduction. They include horizons occurring between A and C horizons in which the main features are (i) colors of low chroma, that is: chromas of 1 or less, without mottles on ped surfaces or in the matrix if peds are lacking; or chromas of 2 or less in hues of 10YR or redder, on ped surfaces or in the matrix if peds are lacking, accompanied by more prominent mottles than those in the C horizon; or hues bluer than 10Y, with or without mottles on ped surfaces or in the matrix if peds are lacking. (ii) colors indicated in (i) and a change in structure from that of the C horizons. (iii) color indicated in (i) and illuviation of clay too slight to meet the requirements of Bt; or accumulation or iron oxide too slight to meet the limits of Bgf. (iv) colors indicated in (i) and removal of carbonates. Bg horizons occur in some Orthic Humic Gleysols and some Orthic Gleysols.

Bfg, Bhfg, Btg, and others. When used in any of these combinations the limits set for f, hf, t, and others must be met.

Bgf The dithionite-extractable Fe of this horizon exceeds that of the IC by 1% or more. Pyrophosphate-extractable Al + Fe is less than the minimum limit specified for 'f' horizons. This horizon occurs in Fera Gleysols and Fera Humic Gleysols, and possibly below the Bfg of gleyed Podzols. It is distinguished from the Bfg of gleyed Podzols on the basis of the extractability of the Fe and Al. The Fe in the Bgf horizon is thought to have accumulated as a result of the oxidation of ferrous iron. The iron oxide formed is not associated intimately with organic matter or with Al, and it is sometimes crystalline. The Bgf horizons are usually prominently mottled, with more than half of the soil material occurring as mottles of high chroma.

Cg, Ckg, Ccag, Csg, Csag. When g is used with C alone, or with C and one of the lower-case suffixes k, ca, s, or sa, it must meet the definition for C and for the particular suffix.

h A horizon enriched with organic matter. It is used with A alone (Ah); or with A and e (Ahe); or with B alone (Bh); or with B and f (Bhf).

Ah A horizon enriched with organic matter that either has a color value at least one unit lower than the underlying horizon or contains 0.5% more organic carbon than the IC, or both. It contains less than 17% organic carbon by weight.

Ahe An Ah horizon that has undergone eluviation as evidenced, under natural conditions, by streaks and splotches of differing shades of gray and often by platy structure. It may be overlain by a darker-colored Ah and underlain by a lighter-colored Ae.

Bh This horizon contains more than 1% organic carbon, less than 0.3% pyrophosphate-extractable Fe, and has a ratio of organic carbon to pyrophosphate-extractable Fe of 20 or more.

Generally the color value and chroma are less than 3 when moist.

Bhf Defined under 'f'.

j Used as a modifier of the suffixes e, f, g, n, and t to denote an expression of, but failure to meet, the specified limits of the suffix it modifies. It must be placed to the right and adjacent to the suffix it modifies. For example Bfgj means a Bf horizon with weak expression of gleying; Bfjgj means a B horizon with weak expression of both 'f' and 'g' features.

Aej It denotes an eluvial horizon that is thin, discontinuous or slightly discernible.

Btj It is a horizon with some illuviation of clay, but not enough to meet the limits of Bt.

Btgj, Bmgj. Horizons that are mottled but do not meet the criteria of Bg.

Bfj It is a horizon with some accumulation of pyrophosphate-extractable Al and Fe but not enough to meet the limits of Bf.

Bntj or Bnj. Horizons in which development of solonetzic B properties is evident but insufficient to meet the limits for Bn or Bnt.

k Denotes the presence of carbonate, as indicated by visible effervescence when dilute HCl is added. Most often it is used with B and m (Bmk) or C (Ck), and occasionally with Ah or Ap (Ahk, Apk), or organic horizons (Ofk, Omk).

m A horizon slightly altered by hydrolysis, oxidation, or solution, or all three, to give a change in color or structure, or both. It has:

1. Evidence of alteration in one of the following forms:
   a) Higher chromas and redder hues than the underlying horizons.
   b) Removal of carbonates, either partially (Bmk) or completely (Bm).
2. Illuviation, if evident, too slight to meet the requirements of a Bt or a podzolic B.
3. Some weatherable minerals.
4. No cementation or induration and lacks a brittle consistence when moist. This suffix can be used as Bm, Bmgj, Bmk, and Bms.

n A horizon in which the ratio of exchangeable Ca to exchangeable Na is 10 or less. It must also have the following distinctive morphological characteristics: prismatic or columnar structure, dark coatings on ped surfaces, and hard to very hard consistence when dry. It is used with B, as Bn or Bnt.

p A horizon disturbed by man's activities, such as cultivation, logging, habitation, etc. It is used with A and O.

s A horizon with salts, including gypsum, which may be detected as crystals or veins, as surface crusts of salt crystals, by depressed crop growth, or by the presence of salt-tolerant plants.

It is commonly used with C and k (Csk), but can be used with any horizon or combination of horizon and lowercase suffix.

sa A horizon with secondary enrichment of salts more soluble than calcium and magnesium carbonates, in which the concentration of salts exceeds that present in the unenriched parent material. The horizon is 10 cm or more thick. The conductivity of the saturation extract must be at least 4 ms/cm and must exceed that of the C horizon by at least one-third.

t An illuvial horizon enriched with silicate clay. It is used with B alone (Bt), with B and g (Btg), with B and n (Bnt), etc.

Bt A Bt horizon is one that contains illuvial layer-lattice clays. It forms below an eluvial horizon, but may occur at the surface of a soil that has been partially truncated. It usually has a higher ratio of fine clay to total clay than IC. It has the following properties:

1. If any part of an eluvial horizon remains and there is no lithologic discontinuity between it and the Bt horizon, the Bt horizon contains more total and fine clay than the eluvial horizons, as follows:

   a) If any part of the eluvial horizon has less than 15% total clay in the fine earth fraction (2mm) the Bt horizon must contain at least 3% more clay, e.g.,Ae 10% clay-Bt minimum 13% clay.

   b) If the eluvial horizon has more than 15% and less than 40% total clay in the fine earth fraction, the ratio of the clay in the Bt horizon to that in the eluvial horizon must be 1.2 or more, e.g., 20% clay increase in the Bt over Ae.

   c) If the eluvial horizon has more than 40% total clay in the fine earth fraction, the Bt horizon must contain at least 8% more clay than the eluvial horizon, e.g. Ae 50% clay; Bt at least 58% clay.

2. A Bt horizon must be at least 5 cm thick. In some sandy soils where clay accumulation occurs in the lamellae, the total thickness of the lamellae should be more than 10 cm in the upper 150 cm of the profile.

3. In massive soils the Bt horizon should have oriented clays in some pores and also as bridges between the sand grains.

4. If peds are present, a Bt horizon shows clay skins on some of the vertical and horizontal ped surfaces and in the fine pores, or shows oriented clays in 1% or more of the cross section, as viewed in thin section.

5. If a soil shows a lithologic discontinuity between the eluvial horizon and the Bt horizon, or if only a plow layer overlies the Bt horizon, the Bt horizon need show only clay skins in some part, either in some fine pores or on some vertical and horizontal ped surfaces. Thin sections should show that some part of the horizon has about 1% or more of oriented clay bodies.

Btj, Btj, and Btg are defined under j and g.

u A horizon that is markedly disrupted by physical or faunal processes other than cryoturbation. Evidence of marked disruption such as the inclusion of material from other horizons, absence of the horizon, etc. must be evident in at least half of the cross section of the pedon. Such turbation can result from blowdown of trees, mass movement of soil on slopes, and burrowing animals. It can be used with any horizon or subhorizon with the exception of A or B alone; e.g. Aeu, Bfu, BCu.

x A horizon of fragipan character. A fragipan is a loamy subsurface horizon of high bulk density and very low organic matter content. When dry, it has a hard consistence and seems to be cemented. When moist, it has moderate to weak brittleness. It frequently has bleached fracture planes and is overlain by a friable B horizon. Air dry clods of fragic horizons slake in water.

y A horizon affected by cryoturbation as manifested by disrupted and broken horizons,, incorporation of materials from other horizons and mechanical sorting in at least half of the cross section of the pedon. It is used with A, B, and C alone or in combination with other subscripts, e.g. Ahy, Ahgy, Bmy, Cy, Cgy, Cygj, etc.

z A frozen layer. It may be used with any horizon or layer, e.g. Ohz, Bmz, Cz, Wz.

Appendix C

DESCRIPTION OF LANDFORMS

C.1 GENETIC MATERIALS

Unconsolidated mineral component

The unconsolidated mineral component consists of clastic sediments that may or may not be stratified, but whose particles are not cemented together. They are essentially of glacial or post-glacial origin but include poorly consolidated and weathered bedrock.

Anthropogenic - Man-made or man-modified materials, including those associated with mineral exploitation and waste disposal.

Colluvial - Massive to moderately well stratified, nonsorted to poorly sorted sediments with any range of particle sizes from clay to boulders and blocks that have reached their present position by direct, gravity-induced movement.

They are restricted to products of mass-wasting whereby the debris is not carried by wind, water, or ice (excepting snow avalanches).

Eolian - Sediment, generally consisting of medium to fine sand and coarse silt particle sizes, that is well sorted, poorly compacted, and may show internal structures such as cross bedding or ripple laminae, or may be massive. Individual grains may be rounded and show signs of frosting.

These materials have been transported and deposited by wind action.

Fluvial - Sediment generally consisting of gravel and sand with a minor fraction of silt and clay. The gravels are typically rounded and contain interstitial sand. Fluvial sediments are commonly moderately to well sorted and display stratification, but massive, nonsorted fluvial gravels do occur. These materials have been transported and deposited by streams and rivers. Finer textured Fluvial deposits of modern rivers are termed Alluvium.

Lacustrine - Sediment generally consisting of either stratified fine sand, silt, and clay deposited on the lake bed; or moderately well sorted and stratified sand and coarser materials that are beach and other nearshore sediments transported and deposited by wave action.

These are materials that either have settled from suspension in bodies of standing fresh water or have accumulated at their margins through wave action.

Marine - Unconsolidated deposits of clay, silt, sand, or gravel that are well to moderately well sorted and well stratified to moderately stratified (in some places containing shells). They have settled from suspension in salt or brackish water bodies or have accumulated at their margins through shoreline processes such as wave action and longshore drift.

Morainal - Sediment generally consisting of well compacted material that is nonstratified and contains a heterogeneous mixture of particle sizes, often in a mixture of sand, silt, and clay that has been transported beneath, beside, on, within and in front of a glacier and not modified by any intermediate agent.

Saprolite - Rock containing a high proportion of residual silts and clays formed by alteration, chiefly by chemical weathering.

The rock remains in a coherent state, interstitial grain relationships are undisturbed and no downhill movement due to gravity has occurred.

Undifferentiated - A layered sequence of more than three types of genetic material outcropping on a steep erosional escarpment.

Volcanic - Unconsolidated pyroclastic sediments. These include volcanic dust, ash, cinders, and pumice.

Qualifying Descriptors

These have been introduced to qualify the genetic materials and to supply additional information about the mode of formation or depositional environment.

Glacial - Used to qualify nonglacial genetic materials or process modifiers where there is direct evidence that glacier ice exerted a strong but secondary or indirect control upon the mode of origin of the materials or mode of operation of the process. The use of this qualifying descriptor implies that glacier ice was close to the site of the deposition of a material or the site of operation of a process.

Glaciofluvial - Fluvial materials showing clear evidence of having been deposited either directly in front of or in contact with glacier ice.

Glaciolacustrine - Lacustrine materials deposited in contact with glacial ice.

Glaciomarine - Materials of glacial origin laid down in a marine environment, as a result of settling from melting, floating ice and ice shelves.

Organic component

The organic component consists of peat deposits containing >30% organic matter by weight that may be as thin as 10 cm if they overlie bedrock but are otherwise greater than 40 cm and generally greater than 60 cm thick. The classes and their definitions follow.

B	Bog
N	Fen
S	Swamp

Bog - A bog is a peat-covered or peat-filled area, generally with a high water table. Since the surface of the peatland is slightly elevated, bogs are either unaffected or partly affected by nutrient-rich groundwaters from the surrounding mineral soils. The groundwater is generally acidic and low in nutrients (ombrotrophic). The dominant peat materials are sphagnum and forest peat, underlain, at times, by fen peat.

Fen - A fen is a peat-covered or peat-filled area with a high water table, which is usually at the surface. The dominant materials are shallow to deep, well to moderately decomposed fen peat. The waters are mainly rich in nutrients (minerotrophic) and are derived from mineral soils. The peat materials are therefore higher in both nutrients and pH than the peats associated with bogs.

Swamp - A swamp is a peat-covered or peat-filled area. The peat surface is level or slightly concave in cross section. The water table is frequently at or above the peat surface. There is strong water movement from margins or other mineral sources. The microrelief is hummocky, with many pools present. The waters are neutral or slightly acid. The dominant peat materials are shallow to deep mesic to humic forest and fen peat.

C.2 GENETIC MATERIAL MODIFIERS

Material modifiers are used to qualify unconsolidated mineral and organic deposits. Particle-size classes serve to indicate the size, roundness, and sorting of unconsolidated mineral deposits. Fiber classes indicate the degree of decomposition and fiber size of organic materials.

Particle size classes for unconsolidated mineral materials

Blocky: An accumulation of angular particles greater than 256 mm in size.

Bouldery: An accumulation of rounded particles greater than 256 mm in size.

Clayey: An accumulation of particles where the fine earth fraction contains 35% or more clay (<0.002 mm) by weight and particles greater than 2 mm are less than 35% by volume.

Cobbly: An accumulation of rounded particles having a diameter of 64-256 mm.

Gravelly: An accumulation of rounded particles ranging in size from pebbles to boulders.

Loamy: An accumulation of particles of which fine earth fraction contains 35% or less clay (<0.002 mm) by weight and particles greater than 2 mm are less than 35% by volume.

Pebbly: An accumulation of rounded particles having a diameter of 2-64 mm.

Rubbly: An accumulation of angular fragments having a diameter of 2-256 mm.

Sandy: An accumulation of particles of which the fine earth fraction contains more than 70% by weight of fine sand or coarser particles. Particles greater than 2 mm occupy less than 35% by volume.

Silty: An accumulation of particles of which the fine earth fraction contains less than 15% of fine sand or coarser particles and has less than 35% clay. Particles greater than 2 mm occupy less than 35% by volume.

Fiber classes for organic materials

The amount of fiber and its durability are important characterizing features of organic deposits in that they reflect on the degree of decomposition of the material. The prevalence of woody materials in peats is also of prime importance.

Fibric: The least decomposed of all organic materials; there is a large amount of well-preserved fiber that is readily identifiable as to botanical origin. Fibers retain their character upon rubbing.

Mesic: Organic material in an intermediate stage of decomposition; intermediate amounts of fiber are present that can be identified as to their botanical origin.

Humic: Highly decomposed organic material; small amounts of fiber are present that can be identified as to their botanical origin. Fibers can be easily destroyed by rubbing.

Woody: Organic material containing more than 50% of woody fibers.

C.3 SURFACE EXPRESSION

The surface expression of genetic materials is their form (assemblage of slopes) and pattern of forms. Form as applied to unconsolidated deposits refers specifically to the product of the initial mode of origin of the materials. When applied to consolidated materials, form refers to the product of their modification by geological processes. Surface expression also indicates the manner in which unconsolidated genetic materials relate to the underlying unit.

Consolidated and Unconsolidated mineral surface classes

Apron - A relatively gentle slope at the foot of a steeper slope and formed by materials from the steeper, upper slope.

Blanket - A mantle of unconsolidated materials thick enough to mask minor irregularities in the underlying unit but still conforming to the general underlying topography.

Fan - A fan-shaped form similar to the segment of a cone and having a perceptible gradient from the apex to the toe.

Hummocky - A very complex sequence of slopes extending from somewhat rounded depressions or kettles of various sizes to irregular to conical knolls or knobs. There is a general lack of concordance between knolls or depressions. Slopes are generally 9-70% (5-35 degrees).

Inclined - A sloping, unidirectional surface with a generally constant slope not broken by marked irregularities. Slopes are 2-70% (1-35 degrees). The form of inclined slopes is not related to the initial mode of origin of the underlying material.

Level - A flat or very gently sloping, unidirectional surface with a generally constant slope not broken by marked elevations and depressions. Slopes are generally less than 2% (1 degree).

Rolling - A very regular sequence of moderate slopes extending from rounded, sometimes confined concave depressions to broad, rounded convexities producing a wavelake pattern of moderate relief. Slope length is often 1.6 km or greater and gradients are greater than 5% (3 degrees).

Ridged - A long, narrow elevation of the surface, usually sharp crested with steep sides. The ridges may be parallel, subparallel, or intersecting.

Steep - Erosional slopes, greater than 70% (35 degrees), on both consolidated and unconsolidated materials. The form of a steep erosional slope on unconsolidated materials is not related to the initial mode of origin of the underlying material.

Terraced - Scarp face and the horizontal or gently inclined surface (tread) above it.

Undulating - A very regular sequence of gentle slopes that extends from rounded, sometimes confined concavities to broad rounded convexities producing a wavelike pattern of low local relief. Slope length is generally less than 0.8 km and the dominant gradient of slopes is 2-5% (1-3 degrees).

Veneer - Unconsolidated materials too thin to mask the minor irregularities of the underlying unit surface. A veneer will range from 10 cm to 1 m in thickness and will possess no form typical of the material's genesis.

Organic surface classes

Blanket - A mantle of organic materials that is thick enough to mask minor irregularities in the underlying unit but still conforms to the general underlying topography.

Bowl - A bog or fen occupying concave-shaped depressions.

Domed - A bog with an elevated, convex, central area much higher than the margin. Domes may be abrupt (with or without a frozen core) or gently sloping or have a stepped surface.

Floating - A level organic surface associated with a pond or lake and not anchored to the lake bottom.

Horizontal - A flat peat surface not broken by marked elevations and depressions.

Plateau - A bog with an elevated, flat, central area only slightly higher than the margin.

Ribbed - A pattern of parallel or reticulate low ridges associated with fens.

Sloping - A peat surface with a generally constant slope not broken by marked irregularities.

Veneer - A thin (40 cm-1m) mantle of organic materials which generally conforms to the underlying topography. They may or may not be associated with discontinuous permafrost.

Appendix D

GUIDES FOR EVALUATING SOIL SUITABILITY FOR SELECTED USES

TABLE 11

Land Classification Standards for Irrigation Suitability

Land Characteristics	Subclass	Class 1 - Very Good	Class 2 - Good	Class 3 - Fair	Class 4 - Poor
SOILS	S				
Texture					
very coarse textured very fine textured	v h	Fine sandy loams to clay loams	Loamy fine sand to light clay	Sand to permeable clay	Gravel to clay
Water holding capacity					
low available moisture capacity	q	40 to 60 sat. % >15cm storage in 1.2m <10cm/hr. hydraulic cond.	35 to 65 sat. % >12.5cm storage in 1.2m <12.5cm/hr. hydraulic cond.	25 to 75 sat. % >7.5cm storage in 1.2m <17.5cm/hr. hydraulic cond.	<25 or >75 sat. % <7.5cm storage in 1.2m >17.5cm/hr. hydraulic cond.
Geological Deposit					
shallow deposit over sand or gravel	k	.9m or more of fine sandy loam or heavier	.6m or more of fine sandy loam or heavier, or .75m plus of loamy fine sand or sandy loam	.5m or more of sandy loam or heavier, or .6m plus of loamy sand	<.5m of sandy loam or heavier, or .6m of loamy sand or sand
shallow deposit over impervious substrata	b	>3m of permeable material	>2m of permeable material	>1m of permeable material	<1m of permeable material
Salinity and Alkalinity[1,2]	a	<4 ms/cm in 0-.6m <8 ms/cm below .6m <6 S.A.R.	<4 ms/cm in 0-.6m <12 ms/cm below .6m <8 S.A.R.	<8 ms/cm in 0-.6m <15 ms/cm below .6m <12 S.A.R.	>8 ms/cm in 0-.6m >15 ms/cm below .6m >12 S.A.R.
EXTERNAL FEATURES					
Stones - rock clearing	r	None to light clearing	Light to medium clearing	Light to heavy clearing	Excessively stony
Topography Slope excess gradient	T	g <1% and 0.1% in general gradient (0-3% slope)	<3% in general gradient (3-5% slope)	<5% in general gradient (5-10% slope)	>5% in general* gradient (>10% slope)**
DRAINAGE	D				
restricted outlet		No problem anticipated	Moderate drainage problem anticipated but may be improved at relatively low cost	Moderate to severe drainage problem anticipated but may be improved by expensive but feasible measures	Drainage improvement not considered feasible
water table		below 2.4m most of year	could be above 1.5m for a short period, then recedes to 2.4m or lower	within 1.5m most of year	within 1m most of year

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* Criteria for gravity (flood) irrigation requirements.

** Estimated adjustments to slope criteria for overhead or sprinkler type irrigation methods.

[1] If sufficient gypsum is present in the soil, the S.A.R. may be lowered by leaching the soil (a very slow process), and the hydraulic conductivity may then improve.

[2] The degree of salinity may vary widely within short distances, and there may be no clear indication of the area occupied by each salinity class. Unless a very detailed mapping and sampling program is carried out, it is impossible to estimate the acreage occupied by each salinity class.

TABLE 12

Guide for assessing soil suitability as source of topsoil

The term "topsoil" includes soil materials used to cover barren surfaces exposed during construction, and materials used to improve soil conditions on lawns, gardens, flower beds, etc. The factors to be considered include not only the characteristics of the soil itself, but also the ease or difficulty of excavation, and where removal of topsoil is involved, accessibility to the site.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - [illegible]
u	Moist Consistence[2]	Very friable, friable	Loose, firm	Very firm	Cemented
i	Flooding	None	May flood occasionally for short periods	Frequent flooding	Constantly flooded
w	Wetness[2]	Wetness is not determining if better than very poorly drained.			Very poorly drained and permanently wet soils
t	Slope	0-5%	5-9%	9-15%	>15%
p	Stoniness[2]	Stones 10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones 0.1 m apart (Class 5)
c	Coarse fragments[2]: percent, by volume	<3%	3-15%	15-35%	>35%
s	Texture[2]	FSL, VFSL, L, SiL, SL, SC if 1:1 clay is dominant	CL, SCL, SiCL, SC if 2:1 clay is dominant; c and sic if 1:1 clay is dominant	S, LS, C and SiC if 2:1 clay is dominant. organic soils[3]	Marl, diatomaceous earth
b	Depth of Topsoil[4]	>40 cm	15-40 cm	8-15 cm	<8 cm
n	Salinity of Topsoil[5]	E.C. 0-1	E.C. 1-4	E.C. 4-8	E.C. >8

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[1] The symbols are used to indicate the nature of the limitation.

[2] For an explanation of texture, consistence, stoniness, coarse fragments and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[3] Non-woody organic materials are assessed as good sources for topsoil if mixed with or incorporated into mineral soil.

[4] The remaining soil material (at least 8 cm) must be reclaimable after the uppermost soil is removed.

[5] E.C. = Electrical Conductivity (millisiemens/cm).

TABLE 13

Guide for assessing soil suitability as source of sand and gravel

The purpose of this table is to provide guidance for assessing the probable supply as well as quality of the sand or gravel for use as road base material and in concrete. The interpretation pertains mainly to the characteristics of the soil substratum to a depth of 150 cm, augmented by observations made in deep cuts as well as geological knowledge where available.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
a	Unified Soil Group	SW SP GW GP	SW-SM SP-SM GP-GM GW-GM	SM SW-SC SP-SC GM GP-GC GW-GC	All other groups and bedrock
h	Depth to Seasonal Water Table	Not class determining if deeper than 50 cm		50 cm	
q	Depth to Sand and Gravel	<25 cm	25-75 cm[2]	>75 cm[2]	
p	Stoniness[3]	Not class determining if stones >.5 m apart (Class 0, 1, 2 and 3)		Stones 0.1-0.5 m apart (Class 4)	Stones <0.1 m apart (Class 5)
d	Depth to Bedrock	>100 cm	50-100 cm	<50 cm	

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[1] The symbols are used to indicate the nature of the limitation.

[2] Rated good if it is known that the underlying gravel or sand deposit is thick (>100 cm).

[3] For an explanation of stoniness and rockiness, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

TABLE 14

Guide for assessing soil suitability as source of roadfill

Fill material for buildings or roads are included in this use. The performance of the material when removed from its original location and placed under load at the building site or road bed are to be considered. Since surface materials are generally removed during road or building construction their properties are disregarded. Aside from this layer, the whole soil to a depth of 150-200 cm should be evaluated. Soil materials which are suitable for fill can be considered equally suited for road subgrade construction.

Symbol[1]	Items Affecting Use[2]	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
a	Subgrade[3]				
	a. AASHO group index[4]	0-4	5-8	>8	
	b. Unified soil classes	GW, GP, SW, SP, SM, GC[5] and SC[5]	CL (with P.I.[6] <15) and ML	CL (with P.I.[6] of 15 or more), CH and MH[7]	OL, OH and Pt
1	Shrink-swell potential	Low	Moderate	High	
f	Susceptibility to frost action[8]	Low	Moderate	High	
t	Slope	0-15%	15-30%	30-45%	>45%
p	Stoniness[9]	Stones >2 m apart (Class 0, 1 and 2)	Stones 0.5-2 m apart (Class 3)	Stones 0.1-0.5 m apart (Class 4)	Stones <0.1 m apart (Class 5)
r	Rockiness[9]	Rock exposures >35 m apart and cover <10% of the surface	Rock exposure 10-35 m apart and cover 10-25% of the surface	Rock exposure 3.5-10 m apart and cover 25-50% of the surface	Rock exposures <3.5 m apart and cover 50-90% of the surface
w	Wetness[9]	Excessively drained to moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained or permanently wet soils
d	Depth to Bedrock	>100 cm	50-100 cm	20-50 cm	<20 cm
h	Depth to Seasonal Water Table	>150 cm	75-150 cm	50-75 cm	<50 cm

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[1] The symbols are used to indicate the nature of the limitation.

[2] The first three items pertain to soil after it is placed in a fill; the last six items pertain to soil in its natural condition before excavation for road fill.

[3] This item estimates the strength of the soil material, that is, its ability to withstand applied loads.

[4] Use AASHO group index only where laboratory data are available for the kind of soil being rated; otherwise, use Unified soil groups.

[5] Downgrade suitability rating to fair if content of fines is more than about 30 percent.

[6] P.I. means plasticity index.

[7] Upgrade suitability rating to fair if MH is largely kaolinitic, friable, and free of mica.

[8] Use this item only where frost penetrates below the paved or hardened surface layer and where moisture transportable by capillary movement is sufficient to form ice lenses at the freezing front.

[9] For an explanation of stoniness, rockiness and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

TABLE 15

Guide for assessing soil suitability for permanent buildings

This guide applies to undisturbed soils to be evaluated for single-family dwellings and other structures with similar foundation requirements. The emphasis for rating soils for buildings is on foundation requirements; but soil slope, susceptibility to flooding and other hydrologic conditions, such as wetness, that have effects beyond those related exclusively to foundations are considered too. Also considered are soil properties, particularly depth to bedrock, which influence excavation and construction costs for the building itself and for the installation of utility lines. Excluded are limitations for soil corrosivity, landscaping and septic tank absorption fields.

Symbol[2]	Items Affecting Use	Degree of Soil Suitability[3]			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[4]	With Basements: Very rapidly, rapidly and well drained. Without Basements: Very rapidly, rapidly, well and moderately well drained.	With Basements: Moderately well drained. Without Basements: Imperfectly drained.	With Basements: Imperfectly, poorly, and very poorly drained. Without Basements: Poorly and very poorly drained.	With Basements: Permanently wet soils. Without Basements: Permanently wet soils.
h	Depth to Seasonal Water Table	With Basements: >150 cm Without Basements: >75 cm	With Basements: 75-150 cm Without Basements: 50-75 cm	With Basements: 25-75 cm Without Basements: 25-50 cm	With Basements: <25 cm Without Basements: <25 cm
i	Flooding	None	None	Occasional flooding (once in 5 years)	Frequent flooding (every year)
t	Slope[5]	0-9%	9-15%	15-30%	>30%
s	Subgrade[6]				
	a. AASHO group index[7]	0-4	5-8	>8	
	b. Unified soil classes	GW, GP, SW, SP, SM and GC and SC	CL (with P.I.[8] <15) and ML	CL (with P.I.[8] of 15 or more), CH and MH	OH, OL and Pt
f	Potential Frost Action[9]	Low (F1, F2)	Moderate (F3)	High (F4)	
p	Stoniness[4]	Stones >10 m apart (Class 0 to 1)	Stones 2-10 m apart (Class 2[10])	Stones 0.1-2 m apart (Class 3[10] to 4)	Stones <0.1 m apart (Class 5[10])
r	Rockiness[4],[11]	Rock exposures >100 m apart and cover <2% of the surface	Rock exposures 30-100 m apart and cover 2-10% of the surface	Rock exposures <30 m apart and cover >10% of the surface	Rock exposures too frequent to allow location of permanent buildings
d	Depth to Bedrock[11]	With Basements: >150 cm Without Basements: >100 cm	With Basements: 100-150 cm Without Basements: 50-100 cm	With Basements: 50-100 cm Without Basements: <50 cm	With Basements: <50 cm

[1] By halving the slope limits, this table can be used for evaluating soil suitability for buildings with large floor areas, but with foundation requirements not exceeding those of ordinary three-storey dwellings.

[2] The symbols are used to indicate the nature of the limitation.

[3] Some soils assessed as fair or poor may be good sites from an aesthetic or use standpoint, but they will require more site preparation and/or maintenance.

[4] For an explanation of rockiness, stoniness and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[5] Reduce the slope limits by one half for those soils subject to hillside slippage.

[6] This item estimates the strength of the soil, that is, its ability to withstand applied loads. When available, AASHO Group Index values from laboratory tests were used; otherwise the estimated Unified classes were used.

[7] Group index values were estimated from information published by the Portland Cement Association (PCA, 1962), pp. 23-25.

[8] P.I. means plasticity index.

[9] Frost heave only applies where frost penetrates to the assumed depth of the footings and the soil is moist. The potential frost action classes are taken from the United States Army Corps of Engineers (1962), pp. 5-8.

[10] Rate one class better for buildings without basements.

[11] Rate one class better if the bedrock is soft enough so that it can be dug with light power equipment such as backhoes.

TABLE 16

Guide for assessing soil suitability for local roads and streets

This guide applies to soils to be evaluated for construction and maintenance of local roads and streets. These are improved roads and streets having some kind of all-weather surfacing, commonly asphalt or concrete, and are expected to carry automobile traffic all year. They consist of: (1) the underlying local soil material (either cut or fill) called the subgrade; (2) the base material of gravel, crushed rock, or lime or soil cement stabilized soil called the subbase; and (3) the actual road surface or pavement, either flexible or rigid. They also are graded to shed water and have ordinary provisions for drainage. With the probable exception of the hardened surface layer, the roads and streets are built mainly from the soil at hand, and cuts and fills are limited, usually less than 2 meters. Excluded from consideration in this guide are highways designed for fast-moving, heavy trucks.

Properties that affect design and construction of roads and streets are: (1) those that affect the load supporting capacity and stability of the subgrade, and (2) those that affect the workability and amount of cut and fill. The AASHO and Unified Classification give an indication of the traffic supporting capacity. Wetness and flooding affect stability. Slope, depth of hardrock, stoniness, rockiness, and wetness affect the ease of excavation and the amount of cut and fill to reach an even grade.

Symbol[2]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[3]	Very rapidly, rapidly, well and moderately well drained	Imperfectly drained	Poorly and very poorly drained	Permanently wet soils
i	Flooding	None	Infrequent (once in 5 years)	Occasional (once in 2-4 years)	Frequent (every year)
t	Slope	0-9%	9-15%	15-30%	>30%
d	Depth to Bedrock[4]	>100 cm	50-100 cm	<50 cm	
a	Subgrade[5]				
	a. AASHO group index[6]	0-4	5-8	>8	
	b. Unified soil classes	GW, GP, SW, SP, SM, GC[7] and SC[7]	CL (with P.I.[8] <15) and ML	CL (with P.I.[8] of 15 or more), CH and MH	OH, OL and Pt
f	Susceptibility to Frost Heave[9]	Low (F1, F2)	Moderate (F3)	High (F4)	
p	Stoniness[3]	Stones >2 m apart (Class 0 to 2)	Stones 0.5-2 m apart (Class 3)	Stones 0.1-0.5 m apart (Class 4)	Stones <0.1 m apart (Class 5)
r	Rockiness[3]	Rock exposures >100 m apart and cover <2% of the surface	Rock exposures 30-100 m apart and cover 2-10% of the surface	Rock exposures <30 m apart and cover >10% of the surface	Rock exposures too frequent to permit location of roads and streets

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[1] These guidelines, with some adjustment of slope and rockiness limits, will also be useful for assessing soils for use as parking lots.

[2] Symbols are used to indicate the nature of the limitation.

[3] For an explanation of stoniness, rockiness and soil drainage classes, see the Canada Soil Information System (Canada Soil Survey Committee, 1978).

[4] Rate one class better if the bedrock is soft enough so that it can be dug with light power equipment and is rippable by machinery.

[5] This item estimates the strength of soil materials as it applies to roadbeds. When available, AASHO Group Index values from laboratory tests were used; otherwise, the estimated Unified classes were used. The limitations were estimated assuming that the roads would be surfaced. On unsurfaced roads, rapidly drained, very sandy, poorly graded soils may cause washboard or rough roads.

[6] Group index values were estimated from information published by the Portland Cement Association (PCA, 1962) pp. 23-25.

[7] Downgrade to moderate if content of fines (less than 200 mesh) is greater than about 30 percent.

[8] P.I. means plasticity index.

[9] Frost heave is important where frost penetrates below the paved or hardened surface layer and moisture transportable by capillary movement is sufficient to form ice lenses at the freezing point. The susceptibility classes are taken from the United States Army Corps of Engineers (1962) pp. 5-8.

TABLE 17

Guide for assessing soil suitability for trench-type sanitary landfills

The trench-type sanitary landfill is a sanitary landfill, in which dry garbage and trash is buried daily in an open trench and covered with a layer of soil material. Suitability of the site is dependent upon the potential for pollution of water sources through groundwater contact with the refuse, or leachate arising from the site. Those properties affecting ease of excavation of the site must be supplemented with geological and hydrological knowledge to provide subsurface soil and groundwater data to a depth of at least 3 to 4.5 m, a common depth of landfills.

Symbol[2]	Items Affecting Use	Degree of Soil Suitability			
		Good - G[3]	Fair - F	Poor - P	Very Poor - V
h	Depth to Seasonal High Water Table	Not class determining if more than 180 cm		100-180 cm	<100 cm
w	Wetness[4]	Not class determining if better than imperfectly drained		Imperfectly drained	Poorly and very poorly drained or permanently wet soils
i	Flooding	None	Rare	Occasional	Frequent
k	Permeability[5]	<5 cm/hr	<5 cm/hr	5-15 cm/hr	>15 cm/hr
t	Slope	0-15%	15-30%	30-45%	>45%
s	Soil Texture[4],[6] (dominant to a depth of 150 cm)	SL, L, SiL, SCL	SiCL[7], CL, SC, LS	SiC, C	Muck, peat, gravel, sand
d	Depth to Hard Bedrock Rippable	>150 cm >150 cm	>150 cm 100-150 cm	100-150 cm 100-150 cm	<100 cm <100 cm
p	Stoniness[4]	Stones >10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones <0.1 m apart (Class 5)
r	Nature of Bedrock	Impermeable			Highly permeable, fractured, easily soluble

---

[1] Based on soil depth (120 cm) commonly investigated in making soil surveys.

[2] The symbols are used to indicate the nature of the limitation.

[3] If probability is high that the soil material to a depth of 3 to 4.5 m will not alter a rating of good or fair, indicate this by an appropriate footnote, such as "Probably good to a depth of 3.5 m", or "Probably fair to a depth of 3.5 m".

[4] For an explanation of stoniness, texture and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[5] Reflects ability of soil to retard movement of leachate from the landfills; may not reflect a limitation in arid and semiarid areas.

[6] Reflects ease of digging and moving (workability) and trafficability in the immediate area of the trench where there may not be surfaced roads.

[7] Soils high in expansive clays may need to be given a suitability rating of poor.

TABLE 18

Guide for assessing soil suitability for area-type sanitary landfills

In the area-type sanitary landfill refuse is placed on the surface of the soil in successive layers. The daily and final cover material generally must be imported. A final cover of soil material at least 60 cm thick is placed over the fill when it is completed.

The soil under the proposed site should be investigated so as to determine the probability that leachates from the landfill can penetrate the soil and thereby pollute water supplies.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
h	Depth to Seasonal Water Table[2]	>150 cm	150-100 cm	50-100 cm	<50 cm
w	Wetness[2],[3]	Rapid to moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained or permanently wet soils
i	Flooding	None	Rare	Occasional	Frequent
k	Permeability[4],[5]	Not class determining if less than 5 cm/hr		5-15 cm/hr	>15 cm/hr
t	Slope	0-9%	9-15%	15-30%	>30%

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[1] The symbols are used to indicate the nature of the limitation.

[2] Reflects influence of wetness on operation of equipment.

[3] For an explanation of drainage, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[4] Reflects ability of the soil to retard movement of leachate from landfills; may not reflect a limitation in arid and semiarid areas.

[5] Due to possible groundwater contamination, impermeable bedrock is considered poor and permeable bedrock is rated very poor for area-type sanitary landfills.

TABLE 19

Guide for assessing soil suitability as cover material for area-type sanitary landfills

The term cover material includes soil materials used to put a daily and final covering layer on refuse in area-type sanitary landfills. This cover material may be derived from the area of the landfill or may be brought in from surrounding areas.

Symbol[1/]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
u	Moist Consistence[2/]	Very friable, friable	Loose, firm	Very firm	Cemented
s	Texture[2/],[3/]	SL, L, SiL, SCL	SiCL, CL, SC, LS	SiC, C	Muck, peat, sand, gravel
d	Depth to bedrock[4/]	>150 cm	100-150 cm	50-100 cm	<50 cm
c	Coarse fragments[2/]	<15%	15-35%	>35%	
p	Stoniness[2/]	Stones >10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones <0.1 m apart (Class 5)
t	Slope	<9%	9-15%	15-30%	>30%
w	Wetness[2/]	Not class determining if better than poorly drained		Poorly drained	Very poorly drained or permanently wet soils

[1/] The symbols are used to indicate the nature of the limitation.

[2/] For an explanation of consistence, texture, coarse fragments, stoniness and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[3/] Soils having a high proportion of non-expansive clays may be given a suitability rating one class better than is shown for them in this table.

[4/] Thickness of material excluding topsoil, which will be stockpiled (see guide for topsoil).

TABLE 20

Guide for assessing soil suitability for reservoirs and sewage lagoons

Factors affecting the ability of undisturbed soils to impound water or sewage and prevent seepage are considered for evaluating soils on their suitability for reservoir and lagoon areas. This evaluation considers soil both as a vessel for the impounded area and as material for the enclosing embankment. As the impounded liquids could be potential sources of contamination of nearby water supplies, e.g. sewage lagoons, the landscape position of the reservoir as it affects risk of flooding must also be considered.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
h	Depth to Water Table[2]	>150 cm	100-150 cm	50-100 cm	<50 cm
i	Flooding[3]	None	None	Subject to infrequent flooding (once in 50 years)	Subject to frequent high level flooding
k	Soil Permeability	0-0.5 cm/hr	0.5-5 cm/hr	5-15 cm/hr	>15 cm/hr
t	Slope	0-2%	2-5%	5-9%	>9%
o	Organic Matter	<2%	2-10%	10-30%	>30%
c	Coarse Fragments[4] <25 cm in diameter, % by volume	<20%	20-35%	>35%	
p	Stoniness[4], >25 cm diameter, percent of surface area	<3% (Class 0, 1 and 2)	3-15% (Class 3)	15-50% (Class 4)	>50% (Class 5)
d	Depth to Bedrock[5]	>150 cm	100-150 cm	50-100 cm	<50 cm
j	Thickness of Slowly Permeable Layer	>100 cm	50-100 cm	50-25 cm	<25 cm
a	Subgrade Unified Soil Classes	GC, SC, CL, & CH	GM, ML, SM & MH	SW & SP	OL, OH & Pt GP, GW

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[1] The symbols are used to indicate the nature of the limitation.

[2] If the floor of the lagoon has nearly impermeable material at least 50 cm thick, disregard depth to water table.

[3] Disregard flooding if it is not likely to enter or damage the lagoon (flood waters have low velocity and depth less than 150 cm).

[4] For an explanation of coarse fragments and stoniness classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[5] Surface exposures of non rippable rock are rated very poor. If underlying bedrock is impermeable, rating should be one class better.

TABLE 21

Guide for assessing soil suitability for septic tank absorption fields

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This guide applies to soils to be used as an absorption and filtering medium for effluent from septic tank systems. A subsurface tile system laid in such a way that effluent from the septic tank is distributed reasonably uniformly into the natural soil is assumed when applying this guide. A rating of poor need not mean that a septic system should not be installed in the given soil, but rather, may suggest the difficulty, in terms of installation and maintenance, which can be expected.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
k	Permeability[2]	Rapid to moderately rapid	Moderate	Slow	Very slow
	Percolation Rate[3] (Auger hole method)	About 8-18 min/cm[3]	18-24 min/cm	Slower than 24 min/cm	
h	Depth to Seasonal Water Table[4]	>150 cm[5]	100-150 cm	50-100 cm	<50 cm
i	Flooding	Not subject to flooding	Not subject to flooding	Subject to occasional flooding (once in 5 years)	Floods every year
t	Slope	0-9%	9-15%	15-30%	>30%
d	Depth to Hard Rock, bedrock or other impervious materials	>150 cm	100-150 cm[6]	50-100 cm	<50 cm

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[1] The symbols are used to indicate the nature of the limitation.

[2] The suitability ratings should be related to the permeability of soil layers at and below depth of the tile line.

[3] Soils having a percolation rate less than about 8 min/cm are likely to present a pollution hazard to adjacent waters. This hazard must be noted, but the degree of hazard must, in each case, be assessed by examining the proximity of the proposed installation to water bodies, water table, and related features. The symbol g is used to indicate this condition. Refer to U.S. Dept. of Health, Education and Welfare (1969) for details of this procedure.

[4] Seasonal means for more than one month. It may, with caution, be possible to make some adjustment for the severity of a water table limitation in those cases where seasonal use of the facility does not coincide with the period of high water table.

[5] A seasonal water table should be at least 100 cm below the bottom of the trench at all times for soils rated Good (U.S. Dept. of Health, Education and Welfare, 1969). The depths used to water table are based on an assumed tile depth of 50 cm. Where relief permits, the effective depth above a water table or rock can be increased by adding appropriate amounts of fill.

[6] Where the slope is greater than 9%, a depth to bedrock of 100-150 cm is assessed as poor.

TABLE 22

Guide for assessing soil suitability for playgrounds

This guide applies to soils to be used intensively for playgrounds for baseball, football, badminton, and for other similar organized games. These areas are subject to intensive foot traffic. A nearly level surface, good drainage, and a soil texture and consistence that gives a firm surface generally are required. The most desirable soils are free of rock outcrops and coarse fragments.

Soil suitability for growing and maintaining vegetation is not a part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of site.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[2]	Rapidly, well and moderately well drained soils with no ponding or seepage. Water table below 75 cm during season of use.	Moderately well drained soils subject to occasional seepage or ponding of short duration and imperfectly drained soils. Water table below 50 cm during season of use.	Imperfectly drained soils subject to seepage or ponding, and poorly drained soils. Water table above 50 cm during season of use.	Very poorly drained and permanently wet soils.
i	Flooding	None during season of use.	Occasional flooding. May flood once every 2-3 years during season of use.	Floods every year during season of use.	Prolonged flooding during season of use.
k	Permeability	Very rapid to moderate.	Moderately slow and slow.	Very slow.	
t	Slope	0-2%	2-5%	5-9%	>9%
d	Depth to Bedrock	>100 cm	50-100 cm[3]	<50 cm[3]	
c	Coarse fragments on surface[2]	Relatively free of coarse fragments.	<20% coarse fragments.	>20% coarse fragments.	
p	Stoniness[2]	Stones >10 m apart. (Class 0 to 1)	Stones 2-10 m apart. (Class 2)	Stones 0.1-2 m apart. (Class 3, 4)	Stones <0.1 m apart. (Class 5)
r	Rockiness[2]	Rock exposures >100 m apart and cover <2% of the surface.	Rock exposures 30-100 m apart and cover about 2-10% of the surface.	Rock exposures <30 m apart and cover >10% of the surface.	Rock outcrops too frequent to permit playground location.
s	Surface Soil Texture[2],[4]	SL, FSL, VFSL, L	SiL, CL, SCL, SiCL, LS	SC, SiC, C[5]; S, Si	Peaty soils; S and LS subject to blowing.
q	Depth to Sand or Gravel[6]	>100 cm	50-100 cm	<50 cm	
m	Useful Moisture[7]	Water storage capacity[8] >15.0 cm and/or adequate rainfall and/or low evapotranspiration.	Water storage capacity[8] 7.5-15 cm and/or moderate rainfall and/or moderate evapotranspiration.	Water storage capacity[8] <7.5 cm and/or low rainfall and/or high evapotranspiration.	

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[1] The symbols are used to indicate the nature of the limitation.

[2] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).
Coarse fragments for the purpose of this table include gravels and cobbles.

[3] Downgrade to a very poor suitability rating if the slope is greater than 5%.

[4] Surface soil texture influences soil ratings as it affects foot trafficability, surface wetness, dust, and maintenance. Adverse soil textures may be partially or completely overcome with the addition of topsoil.

[5] Moderately well and well drained SC, SiC and C soils may be rated fair.

[6] Depth to sand or gravel is considered a limitation in that levelling operations may expose sand or gravel, thereby bringing about adverse surface textures and undesirable amounts of coarse fragments. The addition of topsoil after the levelling process would overcome this limitation.

[7] This item attempts to evaluate the adequacy of moisture for vegetative growth. It incorporates the concept of supply through rainfall, loss through evapotranspiration, and storage within the rooting zone. In soils where the water table is within rooting depth for a significant portion of the year, water storage capacity may not significantly influence vegetation growth.

[8] Consult glossary for definitions of terms used.

TABLE 23

Guide for assessing soil suitability for picnic areas

This guide applies to soils considered for intensive use as park-type picnic areas. It is assumed that most vehicular traffic will be confined to the access roads. Soil suitability for growing and maintaining vegetation is not a part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of site.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[2]	Very rapidly, rapidly, well and moderately well drained soils not subject to seepage or ponding. Water table below 50 cm during season of use.	Moderately well drained soils subject to occasional seepage or ponding and imperfectly drained soils not subject to ponding or seepage. Water Table above 50 cm for short periods during season of use.	Imperfectly drained soils subject to seepage or ponding. Poorly drained soils. Water table above 50 cm and often near surface for a month or more during season of use.	Very poorly drained and permanently wet soils.
i	Flooding	None during season of use.	May flood 1 or 2 times per year for short periods during season of use.	Floods more than 2 times during season of use.	Prolonged flooding during season of use.
t	Slope	0-9%	9-15%	15-30%	>30%
s	Surface Soil Texture[2],[3]	SL, FSL, VFSL, L	SiL, CL, SCL, SiCL, LS, and sand other than loose sand.	SC, SiC, C[4]; Si	Peaty soils; loose sand subject to blowing.
c	Coarse Fragments on Surface[2]	0-20%	20-50%	>50%	
p	Stoniness[2]	Stones >2 m apart (Class 0 to 2)	Stones 1-2 m apart (Class 3)	Stones 0.1-1 m apart (Class 4)	Stones <0.1 m apart (Class 5)
r	Rockiness[2],[5],[6]	Rock exposures roughly 30-100 or more m apart and cover <10% of the surface.	Rock exposures roughly 10-30 m apart and cover 10-25% of the surface.	Rock exposures <10 m apart and cover >25% of the surface.	Rock exposures too frequent to permit location of picnic areas.
m	Useful Moisture[7]	Water storage capacity[8] >15 cm and/or adequate rainfall and/or low evapotranspiration.	Water storage capacity[8] 7.5-15 cm and/or moderate rainfall and/or moderate evapotranspiration.	Water storage capacity[8] <7.5 cm and/or low rainfall and/or high evapotranspiration.	

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[1] The symbols are used to indicate the nature of the limitation.

[2] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978). Coarse fragments for the purpose of this table, include gravels and cobbles. Some gravelly soils may be rated as having a slight limitation if the content of gravel exceeds 20% by only a small margin providing (a) the gravel is embedded in the soil matrix, or (b) the fragments are less than 2 cm in size.

[3] Surface soil texture influences soil ratings as it affects foot trafficability, dust and soil permeability.

[4] Moderately well and well drained SC, SiC and C soils may be rated fair.

[5] Very shallow soils are rated as having severe or very severe limitations for stoniness or rockiness.

[6] The nature and topography of the bedrock exposures may significantly alter these ratings. As such, on-site investigations will be necessary in map units containing bedrock when these are considered as possible sites.

[7] This item attempts to evaluate the adequacy of moisture for vegetative growth. It incorporates the concept of supply through rainfall, loss through evapotranspiration, and storage within the rooting zone. In soils where the water table is within rooting depth for a significant portion of the year, water storage capacity may not significantly influence vegetation growth.

[8] Consult glossary for definitions of terms used.

TABLE 24

Guide for assessing soil suitability for camp areas

This guide applies to soils to be used intensively for tents and camp trailers and the accompanying activities of outdoor living. It is assumed that little site preparation will be done other than shaping and levelling for campsites and parking areas. The soil should be suitable for heavy foot traffic by humans and limited vehicular traffic. Soil suitability for growing and maintaining vegetation is not a part of this guide, but is an important item to consider in the final evaluation of site.

Back country campsites differ in design, setting and management but require similar soil attributes. These guides should apply to evaluations for back country campsites but depending on the nature of the facility the interpreter may wish to adjust the criteria defining a given degree of limitation to reflect the changed requirement. For example, small tentsites may allow rock exposures greater than 10 m apart to be considered a slight limitation.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[2]	Very rapidly, rapidly, well and moderately well drained soils with no seepage or ponding. Water table below 75 cm during season of use.	Moderately well drained soils subject to occasional seepage or ponding and imperfectly drained soils with no seepage or ponding. Water table below 50 cm during season of use.	Imperfectly drained soils subject to seepage or ponding and poorly drained soils. Water table above 50 cm during season of use.	Very poorly drained and permanently wet soils.
i	Flooding	None	Very occasional flooding during season of use. Once in 5-10 years.	Occasional flooding during season of use. Once in 2-4 years.	Flooding during every season of use.
k	Permeability	Very rapid to moderate inclusive.	Moderately slow and slow.	Very slow.	
t	Slope	0-9%	9-15%	15-30%	>30%
s	Surface Soil Texture[2],[3]	SL, FSL, VFSL, L	SiL, SCL, CL, SiCL, LS, and sand other than loose sand.	SC, SiC, C[4]; Si	Peaty soils; loose sand subject to blowing.
c	Coarse Fragments on Surface[2],[5]	0-20%	20-50%	>50%	
p	Stoniness[2],[6]	Stones >10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones < 0.1 m apart (Class 5)
r	Rockiness[2],[6]	No rock exposures	Rock exposures >10 m apart and cover <25% of the area.	Rock exposures <10 m apart and cover >25% of the area.	Rock exposures too frequent to permit campground location.

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[1] The symbols are used to indicate the nature of the limitation.

[2] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[3] Surface soil texture influences soil ratings as it affects foot trafficability, dust, and soil permeability.

[4] Moderately well and well drained SC, SiC and C soils may be rated fair.

[5] Coarse fragments for the purpose of this table include gravels and cobbles. Some gravelly soils may be rated as having slight limitations if the content of gravel exceeds 20% by only a small margin, providing (a) the gravel is embedded in the soil matrix, or (b) the fragments are less than 2 cm in size.

[6] Very shallow soils are rated as having a limitation for rockiness and/or stoniness.

TABLE 25

Guide for assessing soil suitability for paths and trails

It is assumed that the trails will be built at least 45 cm wide and that obstructions such as cobbles and stones will be removed during construction. It is also assumed that a dry, stable tread is desirable and that muddy, dusty, worn or eroded trail treads are undesirable. Hiking and riding trails are not treated separately, but as the design requirements for riding trails are more stringent, a given limitation will be more difficult to overcome. Poor or very poor suitability does not indicate that a trail cannot or should not be built. It does, however, suggest higher design requirements and maintenance to overcome the limitations.

Symbol[1]	Items[2] Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
s	Texture[3],[4]	SL, FSL, VFSL, LS, L	SiL, CL, SiCL, SCL	SC, SiC, C[5]; Sand, Si	Peaty soils; loose sand subject to blowing
c	Coarse Fragment Content[4],[6]	0-20%	20-50%	>50%	
p	Stoniness[4]	Stones >2 m apart (Class 0 to 2)	Stones 1-2 m apart (Class 3)	Stones 0.1-1 m apart (Class 4)	Stones <0.1 m apart (Class 5)
w	Wetness[4]	Very rapidly, rapidly well, and moderately well drained soils. Water table below 50 cm during season of use.	Moderately well drained soils subject to occasional seepage and ponding and imperfectly drained soils. Water table may be above 50 cm for short periods during season of use.	Poorly and very poorly drained soils. Water table above 50 cm and often near surface for a month or more during season of use.	Permanently wet soils.
r	Rockiness[4],[7]	Rock exposures >30 m apart and cover <10% of the surface.	Rock exposures 10-30 m apart and cover 10-25% of the surface.	Rock exposures <10 m apart and cover >25% of the surface.	Rock exposures too frequent to permit location of paths and trails.
t	Slope[8]	0-15%	15-30%	30-60%	>60%
i	Flooding	Not subject to flooding during season of use.	Floods 1 or 2 times during season of use.	Floods more than 2 times during season of use.	Subject to prolonged flooding during season of use.

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[1] The symbols are used to indicate the nature of the limitation.

[2] The items affecting use listed in this table are those which have been shown to cause significant differences in trail response. Elevation, aspect, position on slope, and snow avalanching may have slight affects or influence trail management and should be considered in the final site evaluation. Items such as vegetation, fauna, and scenic value are not considered in the guidelines (Epp, 1977).

[3] Texture refers to the soil texture which will form the tread texture. This is the surface texture on level areas but may be a subsurface texture on slopes. Textural classes are based on the less than 2 mm soil fraction. Texture influences soil ratings as it influences foot trafficability, dust, design or maintenance of trails, and erosion hazards.

[4] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[5] Moderately well and well drained SC, SiC and C soils may be rated fair.

[6] Coarse fragments for the purpose of this table, include gravels and cobbles. Gravels tend to cause unstable footing when present in high amounts, and are also associated with increased erosion. Cobbles (and stones) must be removed from the trail tread, increasing construction and maintenance difficulties. Some gravelly soils may be rated as having a slight limitation if the content of gravel exceeds 20% by only a small margin providing (a) the gravel is embedded in the soil matrix or (b) the fragments are less than 2 cm in size.

[7] The type of rock outcrop (flat lying vs cliffs), and the orientation of the structure (linear cliffs vs massive blocks) can greatly alter the degree of the limitation. Each site with a Rockiness limitation based on the percent rock outcrop above should be evaluated on its own merits and the degree of limitation should then be modified appropriately if necessary.

[8] Slope in this context refers to the slope of the ground surface, not the slope of the tread.

Appendix E

CORRELATION OF THE SOILS OF THE SEMI-DETAILED RESURVEY OF THE RURAL MUNICIPALITY OF LORNE WITH THE SOILS OF THE RECONNAISSANCE SOIL SURVEY OF SOUTH-CENTRAL MANITOBA (1943)

The resurvey of the Rural Municipality of Lorne replaces the 1936-37 survey (published 1943) of South-Central Manitoba which included the Rural Municipality of Lorne. This resurvey at a scale of 1:50,000 and some 1:20,000, benefits from more intensive examination of soils in the field and the use of a larger map scale to permit the delineation of local soils, not possible in the 1:126,720 scale reconnaissance map.

The reconnaissance soil survey of the study area employed broadly defined soil groupings called "Soil Associations" consisting of related but unlike soils that occur in a characteristic pattern on similar parent material. These related soils called "soil associates" occupy different positions in the landscape and differ in profile characteristics because of local influences of topography, drainage and vegetation. Individual soil associates can occupy large continuous land areas, but more commonly occupy small areas and occur in complex patterns with other associates.

In the 1:50,000 and 1:20,000 resurveys, "soil series" a conceptual soil grouping approximately equivalent to "soil associates" in the reconnaissance soil survey, is used as the basic map unit component, and as a map delineation label. In general the allowable range in variation of soil profile characteristics is significantly less than that permitted in the description of soil associates. The reconnaissance soil survey utilized seven soil associations, one soil complex and a miscellaneous soil type without combinations to map the soils of the R.M. of Lorne. The semi-detailed resurvey described the same soil variability with numerous combinations of sixty different named soils series and a soil complex. A comparison of the soil series used in the current resurvey with associations, soil associates and phases used in the South-Central Manitoba soil report is presented in Table 26.

TABLE 26

Correlation of the Soils in the Resurvey of the Rural Municipality of Lorne (1986) with the Soils of the Survey of South-Central Manitoba (1943)

SOIL SYMBOL	SOIL NAME	SUBGROUP	SOUTH-CENTRAL SOIL REPORT SOIL ASSOCIATION	REMARKS
ATN	Altamont	Orthic Dark Gray	Altamont	The Altamont series correlates with the dominant, well drained (phytomorphic) transitional associate of the Altamont Association occurring where lacustrine material is intermixed with water-worked till.
BWO	Barwood	Gleyed Rego Black	Hilton	The Barwood series correlates with the carbonated, inperfectly drained (phyto-hydromorphic) minor associate of the Hilton Association.
CAV	Carvey	Rego Humic Gleysol	Agassiz, Indian Springs Complex	The Carvey series correlates with the carbonated, poorly drained (hydromorphic) associate of the Agassiz Association. It differs slightly by having a thicker loam to clay loam surface overlying the gravel. Carvey soils also correlate with gravelly transition areas initially designated as Indian Springs Complex.
CKD	Crookdale	Gleyed Rego Black	Glenboro	The Crookdale series correlates with the unidentified imperfectly drained minor associate of the dominantly well-drained Glenboro Association.
CXT	Capell	Gleyed Rego Black	Agassiz, Indian Springs Complex	The Capell series correlates with the carbonated, imperfectly drained minor associate of the Agassiz Association. It is also mapped in gravelly transition areas initially designated as Indian Springs Complex where imperfectly drained, carbonated profiles occur.
CYN	Croyon	Orthic Black	Agassiz, Indian Springs Complex	The Croyon series correlates with the well drained, associate of the Agassiz Association. It differs slightly in having a thicker coarse loamy surface over the gravel than is typical of the Agassiz Association. Croyon soils also correlate with gravelly transition areas of the Indian Springs Complex.
CYN1	Croyon	Orthic Black	Agassiz Indian Springs Complex	The Croyon, shale gravel variant correlates with the shale gravel areas included in the Agassiz Association and Indian Springs Complex.

TABLE 26. Con't

SOIL SYMBOL	SOIL NAME	SUBGROUP	SOUTH-CENTRAL SOIL REPORT SOIL ASSOCIATION	REMARKS
CZK	Cazlake	Rego Humic Gleysol	Darlingford	The Cazlake series correlates with poorly drained associates of the Darlingford Association and occurs in the depressional sites of hummocky morainal terrain.
DGF	Darlingford	Orthic Black	Darlingford	The Darlingford series correlates with the dominant, well drained associate of the Darlingford Association.
DLN	Danlin	Gleyed Dark Gray	Carroll, Altamont	The Danlin series correlates with an imperfectly drained minor inclusion of the Carroll Association. In Lorne the Danlin series is included in areas previously mapped in the deeper overlay areas of the Altamont Association.
DXM	Druxman	Cleyed Black	Agassiz, Indian Springs Complex	The Druxman series correlates with the imperfectly drained associate of the Agassiz Association. It differs in having a thicker coarse loamy surface over the gravel substrate than is typical of the Leary Association. Druxman soils also correlate with gravelly transition areas of the Indian Springs Complex.
DZW	Dezwood	Orthic Dark Gray	Pembina	The Dezwood series correlates with the less strongly leached well drained associate of the Pembina Association.
FFR	Fifere	Orthic Dark Gray	Snowflake	The Fifere series correlates with the well drained, weakly calcareous, shaley associate of the Snowflake Association. In Lorne, Fifere soils are mapped in areas originally designated as dominantly Altamont or Pembina Association map delineations. These shale soils were identified in the written description of the Altamont Association.
FIR	Firdale	Orthic Dark Gray	Carroll, Altamont	The Firdale series correlates with the more strongly developed, well drained associate of the Carroll Association. In Lorne, Firdale soils are mapped in the deep overlay areas previously included in the map delineations of the Altamont Association.
FRS	Ferris	Gleyed Rego Black	Darlingford	The Ferris series correlates with the imperfectly drained, minor associate of the Darlingford Association.

TABLE 26. Con't

SOIL SYMBOL	SOIL NAME	SUBGROUP	SOUTH-CENTRAL SOIL REPORT SOIL ASSOCIATION	REMARKS
FSO	Fresno	Gleyed Dark Gray	Snowflake	The Fresno series correlates with the imperfectly drained, weakly calcareous, shaly associate of the Snowflake Association.
GRR	Guerra	Rego Humic Gleysol	Altamont	The Guerra series correlates with the minor inclusions of poorly drained, less strongly leached black earths associates of the Altamont Association.
HIT	Hilton	Orthic Black	Hilton	The Hilton series correlates with the well drained, dominant associate of the Hilton Association.
HKS	Hickson	Rego Humic Gleysol	Hilton	The Hickson series correlates with the significant, poorly drained associate of the Hilton Association occurring in depressions and adjacent to sloughs.
HOS	Horose	Rego Humic Gleysol	Pembina	The Horose series correlates with the poorly drained, minor associate of the Pembina Association.
JYL	Joyale	Gleyed Rego Black	Altamont	The Joyale series correlates with the imperfectly drained, less strongly leached blackearth associate of the Altamont Association.
KIS	Kingsley	Orthic Dark Gray Luvisol	Altamont	The Kingsley series correlates with the well drained gray-wooded, minor associate of the Altamont Association.
KUD	Knudson	Orthic Black	Altamont	The Knudson series correlates with the well drained, blackearth; a significant associate of the Altamont Association.
LEI	Levine	Gleyed Cumulic Regosol	Eroded Slopes Complex	The Levine series correlate with the variable alluvial deposits occurring on relatively level topography in the map complex designated as Eroded Slopes Complex.
LRY	Leary	Orthic Dark Gray	Leary	The Leary series correlates with the dominant, well drained, Gray black soil associate of the Leary Association.

TABLE 26. Con't

SOIL SYMBOL	SOIL NAME	SUBGROUP	SOUTH-CENTRAL SOIL REPORT SOIL ASSOCIATION	REMARKS
LRY1	Leary	Orthic Dark Gray	Leary	The Leary coarse-loamy substrate variant correlates with the minor unnamed associate of the Leary Association with the same soil profile properties.
MXS	Manitou	Orthic Black	Manitou	The Manitou series correlates with the weakly to non-calcareous, well drained associate of the Manitou Association developed dominantly on shale till.
NKK	Nikkel	Gleyed Black	Darlingford	The Nikkel series correlates with the imperfectly drained, minor associate of the Darlingford Association.
NSH	Narish	Rego Humic Gleysol	Altamont	The Narish series correlates with the poorly drained, minor associate of the Altamont Association.
NYO	Nayler	Orthic Dark Gray Luvisol	Snowflake	The Nayler series correlates with the well drained, Gray-wooded associate of the Snowflake Association developed on non-calcareous shale till. Nayler soils are mapped mostly on shale till ridges which occur as inclusions in Pembina Association map delineations as well as Snowflake Association map delineations.
OIV	Oliver	Gleyed Black Solonetz	Oliver	The Oliver series correlates with the dominant imperfectly drained associate of the Oliver Association.
PBI	Pembina	Orthic Dark Gray Luvisol	Pembina	The Pembina series correlates with the dominant, well drained Gray-wooded associate of the Pembina Association.
PBI1	Pembina	Orthic Dark Gray Luvisol	Pembina	The Pembina coarse-loamy substrate variant correlates with unnamed minor inclusions of the Pembina Association and is transitional to the deep overlays of the Altamont Association.
PBI2	Pembina	Orthic Dark Gray Luvisol	Pembina	The Pembina sandy-skeletal substrate variant correlates with unnamed minor inclusions of the Pembina Association and is transitional to the deep gravel deposits of the Leary Association.

TABLE 26. Con't

SOIL SYMBOL	SOIL NAME	SUBGROUP	SOUTH-CENTRAL SOIL REPORT SOIL ASSOCIATION	REMARKS
PDA	Prodan	Gleyed Rego Black	Carroll, Altamont	The Prodan series correlates with the significant inclusions of the imperfectly drained associate of the Carroll Association. In Lorne, the Prodan series is mapped in areas originally included in the Altamont Association as well as the Carroll Association.
PER	Perillo	Terric Mesisol	Meadow/Marsh phases	The Perillo series correlates with moderately deep (40 to 160 cm), poorly drained organic deposits over mineral soils designated as meadow or marsh phases (by on-site map symbols) of various soil associations.
PYR	Poyser	Orthic Gray Luvisol	Pembina	The Poyser series correlates with minor inclusions of the well drained, Gray-wooded associate of the Pembina Association.
PYR1	Poyser	Orthic Gray Luvisol	Pembina	The Poyser coarse-loamy substrate variant correlates with minor unnamed inclusions of the Pembina Association and is transitional to the deeper coarse-loamy deposits of the Altamont or Carroll Associations.
PYR2	Poyser	Orthic Gray Luvisol	Pembina	The Poyser sandy-skeletal substrate variant correlates with minor unnamed inclusions of the Pembina Association and is transitional to the sandy-skeletal Leary Association.
RAM	Ramada	Orthic Black	Carroll	The Ramada series correlates with minor inclusions of the well drained Carroll Association.
TDP	Tadpole	Rego Humic Gleysol	Carroll	The Tadpole series correlates with the poorly drained associate of the Carroll Association. In Lorne, Tadpole soils are mapped in depressions and drainage ways of areas delineated as Altamont Association as well as the Carroll Association.
TGL	Tiger Hills	Orthic Dark Gray	Hilton	In R. M. of Lorne, the Tiger Hills series correlates with significant inclusions of the well drained, Gray-black associate of the Hilton Association occurring chiefly under woods on northern and eastern slopes of morainic hills.

TABLE 26. Con't

SOIL SYMBOL	SOIL NAME	SUBGROUP	SOUTH-CENTRAL SOIL REPORT SOIL ASSOCIATION	REMARKS
TGL1	Tiger Hills	Orthic Dark Gray	Hilton, Carroll-Hilton Transition	The Tiger Hills coarse-loamy substrate variant correlates with local soil types in areas designated as Carroll-Hilton Transition. In Lorne, this transition also occurs in some areas originally mapped as the Hilton Association.
TLI	Tellier	Gleyed Dark Gray	Altamont	The Tellier series correlates with minor inclusions of the imperfectly drained associate of the Altamont Association.
TNT	Trinton	Orthic Dark Gray Luvisol	Leary	The Trinton series correlates with minor inclusions of the well drained Gray-wooded associate of the Leary Association. It differs in having a thicker coarse loamy surface over the gravel than is typical in the Leary Association.
ULH	Ullrich	Gleyed Black	Altamont	The Ullrich series correlates with minor inclusions of the imperfectly drained Blackearth associate of the Altamont Association.
VDL	Vandal	Orthic Dark Gray	Leary, Indian Springs Complex	The Vandal series correlates with dominant inclusions of the well drained Gray-black associate of the Leary Association. It differs from the typical Leary Association in having a deeper coarse loamy surface than is common. Vandal soils also correlate with local soil types in the gravelly transition areas of the Indian Springs Complex.
VDL1	Vandal	Orthic Dark Gray	Leary, Indian Springs Complex	The Vandal shale gravel substrate variant correlates with the dominantly shale gravel areas described as inclusions in the Leary Association and Indian Springs Complex.
VDL2	Vandal	Orthic Dark Gray	Indian Springs Complex	The Vandal sandy substrate variant correlates with the sandy substrate areas included in the Indian Springs Complex and Leary Associations.
VTL	Vartel	Gleyed Dark Gray	Leary, Indian Springs Complex	The Vartel series correlates with minor inclusions of the imperfectly drained associate of the Leary Association. Vartel soils also correlate with imperfectly drained inclusions of Indian Springs Complex where loamy over sandy-skeletal parent materials predominate.

TABLE 26. Con't

SOIL SYMBOL	SOIL	SUBGROUP	SOUTH-CENTRAL SOIL REPORT SOIL ASSOCIATION	REMARKS
XV1	Xavier	Typic Mesisol	Meadow/Marsh phases	The Xavier series correlates with deep (>160 cm), poorly drained organic deposits designated as meadow or marsh phases (by map site symbols) of various soil associations.
ZPI	Zaplin	Gleyed Dark Gray	Pembina	The Zaplin series correlates with minor inclusions of the imperfectly drained associate of the Pembina Association.

Appendix F

DETAILED SOIL DESCRIPTIONS

KUD MANITOBA 1985 PROFILE NO. 1

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC BLACK. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: KUD, ASSOCIATED SOILS: RAM.

LOCATION: MILITARY GRID REF. 14 UNK 2130 7500; NTS MAP AREA 62G 7; SE 35 5 10 W.

CLIMATE: 1525 FEET ABOVE MEAN SEA LEVEL. SOIL TEMP READING NO. 1 WAS 6 DEG(C) AT 100 CM IN SEPTEMBER.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), GLACIOLACUSTRINE; PARENT MATERIAL 2: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL); LANDFORM CLASSIFICATION: LACUSTRINE, UNDULATING; SLOPE: 3% SIMPLE SLOPE OF CLASS 3 (2-5%), FACING EAST, SITE AT UPPER SLOPE POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY,200 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: SUBSOIL IS A MODIFIED TILL WITH CLEANER AREAS OF SILT.

AP: 0 TO 17 CM, RANGE 15 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/1; CLAY LOAM; WEAK TO MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; WAVY, CLEAR HORIZON BOUNDARY.

BM: 17 TO 36 CM, RANGE 10 TO 30 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2.5, MATRIX DRY 10YR 5.5/3; CLAY LOAM; WEAK, MEDIUM, COLUMNAR STRUCTURE; WEAK TO MODERATE, MEDIUM, ANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR FORES; WAVY, CLEAR HORIZON BOUNDARY.

BC: 36 TO 65 CM, RANGE 24 TO 34 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5.5/4, MATRIX DRY 2.5Y 7.5/2; CLAY LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, MEDIUM, GRANULAR SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; WAVY, CLEAR HORIZON BOUNDARY.

2CK1: 65 TO 105 CM, RANGE 38 TO 50 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4.5/4, MATRIX DRY 2.5Y 7/4; CLAY LOAM; WEAK, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, MEDIUM, GRANULAR SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; MODERATELY POROUS, MANY, VERY FINE, VERTICAL, INFED, CONTINUOUS, SIMPLE, TUBULAR PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; 10% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

2CK2: 105 TO 135 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5.5/6, MATRIX DRY 2.5Y 7/5; SILT LOAM; WEAK TO MODERATE, COARSE, PLATY STRUCTURE PSEUDO; WEAK TO MODERATE, FINE TO MEDIUM, ANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; STRONG EFFERVESCENCE; STRONGLY CALCAREOUS.

AUG 18, 1986

KUD MANITOBA 1985 PROFILE NO. 1

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	7.6	4.20	0.33				3.4	32.7		27.2	2.9	0.2	0.7
BM	7.7	1.04	0.11				2.0	24.4		17.5	4.1	0.2	0.7
BC	7.5	0.54	0.06	20.3	13.6	6.2		17.7		21.0	8.7	0.3	0.6
2CK1	7.7			23.4	15.1	7.6		18.4		19.4	10.0	0.3	0.6
2CK2	7.8			18.3	7.9	9.5		18.2		18.1	9.1	0.4	0.7

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.5	57.4
BM	0.4	51.4
BC	0.4	47.4
2CK1	0.8	54.1
2CK2	0.7	55.2

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY	BULK DENS G/CC
AP				98	1	3	6	11	9	30		43	27		0.98
BM				99	1	2	4	6	10	23		45	32		1.12
BC				99	1	3	5	10	9	28		40	32		1.42
2CK1				96	1	3	6	7	5	22		49	29		1.43
2CK2				99	0	1	1	3	3	8		63	29		1.32

KUD MANITOBA 1985 PROFILE NO. 1

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			18.0		36.3								
EM			14.5		32.4								
BC			13.1		23.8								
2CK1			15.0		25.4	21.0	43.0	22.0		1.8	19.0	76	10
2CK2			12.5		29.0	21.0	43.0	23.0		1.7	19.0	76	10

AUG 18, 1986

FFR MANITOBA 1985 PROFILE NO. 2

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF RECONNAISANCE SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; DEVIATION(S): TEXTURE; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: NOTATION: FFR, ASSOCIATED SOILS: VDL. SOIL PHASES: SLIGHTLY ERODED.

LOCATION: MILITARY GRID REF. 14 UMK 9855 7090; NTS MAP AREA 62G 6; NW 15 5 12 W.

CLIMATE: 1500 FEET ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), SUMMERFALLOW.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MEDIUM ACID TO NEUTRAL (PH 5.6-7.3), MORAINAL (TILL), SHALE; PARENT MATERIAL 2: CHEMICAL AND PHYSICAL WEATHERING, COARSE LOAMY AND COARSE SILTY (<18% CLAY), WEAKLY CALCAREOUS (1 TO 6% CACO3), MORAINAL (TILL), SHALE; LANDFORM CLASSIFICATION: GLACIO MORAINAL, WASHED, HUMMOCKY; SLOPE: 7% COMPLEX SLOPE OF CLASS 4 (6-9%), FACING SOUTHEAST, SITE AT MIDDLE POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY, 20 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, RAPID SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: BORDERLINE VANDAL 1 (SHALE)

AP: 0 TO 16 CM, RANGE 13 TO 18 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 2.5Y 5/2; LOAM; WEAK TO MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK, MEDIUM, GRANULAR SECONDARY STRUCTURE; FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; COMMON, VERY THIN CLAY FILMS ON PED FACES-UNSPECIFIED; 20% GRAVELLY COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY.

BM: 16 TO 46 CM, RANGE 23 TO 43 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/2, MATRIX DRY 2.5Y 6.5/2; GRAVELLY LOAM; FRIABLE, NONPLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS; CLAY FILMS 10YR 3/3; 60% SHALY COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY.

2BC: 46 TO 60 CM, RANGE 8 TO 24 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5/4, MATRIX DRY 2.5Y 6.5/2; FINE SANDY LOAM; WEAK, FINE, PLATY STRUCTURE PSEUDO; SINGLE GRAIN SECONDARY STRUCTURE; LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; WEAKLY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY.

2CK: 60 TO 110 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 3.5/2, MATRIX DRY 2.5Y 6/2; VERY GRAVELLY COARSE SANDY LOAM; FRIABLE, NONPLASTIC CONSISTENCE; HIGHLY POROUS; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; 60% SHALY COARSE FRAGMENTS.

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	6.8	3.26	0.29				6.8	38.4		21.3	3.7	0.2	2.1
BM	7.1	1.15	0.13				5.2	27.7		18.3	3.8	0.3	1.6
2BC	7.6	0.46	0.06	3.7	1.8	1.8	2.8	22.0		17.7	5.1	0.3	1.2
2CK	7.7			7.9	5.3	2.4		21.5		22.2	5.9	0.3	1.1

FFR MANITOBA 1985 PROFILE NO. 2

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.6	64.4
BM	0.5	63.3
2BC	0.6	48.1
2CK	0.5	50.9

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

	% PASSING										% OF SAMPLE			
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP		96	92	88	3	7	9	9	7	35		39	26	
BM		96	70	58	6	14	14	9	4	47		30	23	
2BC				98	0	3	13	32	15	63		22	15	
2CK		97	62	46	19	22	11	10	6	68		20	12	

PHYSICAL DATA

	SURVEY (CON'T)								ENGINEERING				
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			20.7										
BM			20.5			37.0	58.0	31.0		1.4	17.0	27	07
2BC													
2CK						31.0	45.0	31.0		1.4	13.0	27	07

AUG 18, 1986

FFR MANITOBA 1985 PROFILE NO. 3

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF RECONNAISANCE SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: FINE LOAMY, NEUTRAL, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: FFR, ASSOCIATED SOILS: VDL.

LOCATION: MILITARY GRID REF. 14 UMK 9925 7095; NTS MAP AREA 62G 6; NW 15 5 12 W.

CLIMATE: 1500 FEET ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MEDIUM ACID TO NEUTRAL (PH 5.6-7.3), MORAINAL (TILL), SHALE; LANDFORM CLASSIFICATION: INACTIVE MORAINAL, WASHED, HUMMOCKY; SLOPE: 6% COMPLEX SLOPE OF CLASS 4 (6-9%), FACING WEST, SITE AT UPPER SLOPE POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY,60 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: SITE LOCATED IN NE CORNER OF SW QUARTER

AP: 0 TO 18 CM, RANGE 15 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2.5/1.5, MATRIX DRY 2.5Y 5/1.5; LOAM; MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; 20% CHANNERY AND SHALY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

BT: 18 TO 47 CM, RANGE 21 TO 36 CM; HORIZON MOIST; MATRIX MOIST 10YR 3.5/3, MATRIX DRY ; SANDY CLAY LOAM; FEW, MEDIUM, PROMINENT, 10YR 6/8 MOTTLES; MODERATE TO STRONG, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FIRM, PLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MANY, VERY THIN CLAY FILMS IN MANY VOIDS/CHANNELS AND ON SOME VERTICAL AND HORIZONTAL PED FACES, 2.5Y 4/4; 40% CHANNERY AND SHALY COARSE FRAGMENTS; WAVY, GRADUAL HORIZON BOUNDARY.

BC: 47 TO 84 CM, RANGE 20 TO 40 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/3, MATRIX DRY ; SANDY CLAY LOAM; FEW, MEDIUM, PROMINENT, 7.5YR 4/6 MOTTLES; MODERATE, MEDIUM TO COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FIRM, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 40% CHANNERY AND SHALY COARSE FRAGMENTS; WAVY, GRADUAL HORIZON BOUNDARY.

C: 84 TO 135 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/4, MATRIX DRY ; SANDY CLAY LOAM; FEW, FINE, PROMINENT MOTTLES; 10YR 3/6 MOTTLES; MODERATE TO STRONG, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, INPED, DISCONTINUOUS, SIMPLE, TUBULAR PORES; 40% CHANNERY AND SHALY COARSE FRAGMENTS.

FFR MANITOBA 1985 PROFILE NO. 3

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	6.5	1.55	0.14	6.6	27.2		17.5	2.1	0.2	1.9
BT	6.8	0.55	0.07	6.6	28.4		17.1	4.2	0.3	1.8
BC	6.0	0.33	0.06	6.0	26.4		14.0	4.0	0.3	1.4
C	6.0			5.8	26.2		14.7	4.0	0.4	1.3

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.3	56.2
BT	0.2	54.8
BC	0.2	48.8
C	0.9	52.6

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP		98	93	85	5	15	12	10	7	49		30	21	
BT		98	74	56	3	14	15	9	5	46		25	29	
BC			85	73	3	15	17	10	8	53		21	26	
C			86	73	2	14	16	14	5	51		24	25	

AUG 18, 1986

FFR MANITOBA 1985 PROFILE NO. 3

PHYSICAL DATA

	SURVEY (CON'T) MOISTURE STATUS (%)					ENGINEERING							
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			20.2										
BT			21.6										
BC			19.9										
C						32.0	51.0	42.0		1.5	13.0	75	07

JYL MANITOBA 1985 PROFILE NO. 4

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF RECONNAISANCE SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, HUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: JYL.

LOCATION: MILITARY GRID REF. 14 UMK 9700 6790; NTS MAP AREA 62G 6; NW 4 5 12 W.

CLIMATE: 1450 FEET ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), GLACIOLACUSTRINE, UNDIFFERENTIATED OR UNDETERMINED; PARENT MATERIAL 2: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, UNDULATING; SLOPE: 1.5% SLOPE OF CLASS 2 (0.5-2%), FACING WEST, SITE AT MIDDLE POSITION, 60 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: WATERWORKED TILL. 2CK2 FEWER STONES

APK: 0 TO 22 CM, RANGE 19 TO 30 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/1; CLAY LOAM; WEAK, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK, MEDIUM, GRANULAR SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY.

CCA: 22 TO 32 CM, RANGE 7 TO 17 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/2, MATRIX DRY 10YR 8/1; CLAY LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; MODERATE, MEDIUM, GRANULAR SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; WAVY, CLEAR HORIZON BOUNDARY.

2CKG1: 32 TO 100 CM, RANGE 50 TO 70 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5/4, MATRIX DRY 10YR 8/2; SANDY CLAY LOAM; FEW, COARSE, PROMINENT, 7.5YR 3/4 MOTTLES; COMMON, MEDIUM, PROMINENT, 10YR 6/6 MOTTLES; MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FIRM, PLASTIC CONSISTENCE; FEW, FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; 40% GRAVELLY AND COBBLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

2CKG2: 100 TO 120 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/4, MATRIX DRY 10YR 8/2; CLAY LOAM; COMMON, COARSE, PROMINENT, 10YR 4/6 MOTTLES; MANY, MEDIUM, PROMINENT, 2.5Y 5/6 MOTTLES; WEAK, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FIRM, PLASTIC CONSISTENCE; MODERATELY POROUS, FEW, VERY FINE, VERTICAL, INPED, DISCONTINUOUS, SIMPLE, TUBULAR PORES; FEW, MEDIUM, SPHERICAL IRON-MANGANESE CONCRETIONS LOCATED LOCAL CONCENTRATIONS (10YR 2/1); MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; 20% GRAVELLY COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APK	7.8	3.35	0.26	6.1	4.4	1.6	1.6	28.5		25.9	10.7	0.6	0.8
CCA	7.9			25.1	18.5	6.1		16.7		22.4	8.1	0.6	0.7
2CKG1	8.0			27.9	19.4	7.8		11.6		18.0	9.0	1.8	0.6
2CKG2	7.9			17.8	7.3	9.7		15.2		19.7	9.0	2.5	0.7

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APK	0.8	55.3
CCA	2.0	43.0
2CKG1	4.0	35.9
2CKG2	2.5	45.8

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APK				99	1	3	11	15	11	41		29	30	
CCA			98	96	2	5	9	10	10	36		29	35	
2CKG1		91	79	74	3	8	11	12	14	48		23	29	
2CKG2			97	96	2	5	9	12	10	38		34	28	

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APK			14.2										
CCA			11.5										
2CKG1						13.0	33.0	17.0		1.9	17.0	60	08
2CKG2			10.7			14.0	38.0	14.0		2.0	22.0	60	10

AUG 18, 1986

ATN MANITOBA 1985 PROFILE NO. 5

IDENTIFICATION: SURVEYED BY MHL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: NOTATION: ATN, ASSOCIATED SOILS: DLN.

LOCATION: MILITARY GRID REF. 14 UNK 2640 8350; NTS MAP AREA 62G 10; SW 28 6 9 W.

CLIMATE: 1575 FEET ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MEDIUM ACID TO NEUTRAL (PH 5.6-7.3), LACUSTRINE, MIXED; PARENT MATERIAL 2: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: MORAINAL, HUMMOCKY; SLOPE: 5% SIMPLE SLOPE OF CLASS 3 (2-5%), FACING SOUTH, SITE AT LOWER SLOPE POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY,100 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: DISTINCT CONTACT LAC OVER TILL

AP: 0 TO 15 CM, RANGE 14 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 4.5/1.5; CLAY LOAM; MODERATE, MEDIUM TO COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; WAVY, CLEAR HORIZON BOUNDARY.

AB: 15 TO 37 CM, RANGE 22 TO 41 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2.5, MATRIX DRY 10YR 5/2; CLAY LOAM; WEAK, COARSE, PRISMATIC STRUCTURE; MODERATE TO STRONG, MEDIUM TO COARSE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; WAVY, GRADUAL HORIZON BOUNDARY.

BT: 37 TO 60 CM, RANGE 19 TO 34 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/3, MATRIX DRY 10YR 7/3; CLAY LOAM; WEAK, COARSE, PRISMATIC STRUCTURE; MODERATE TO STRONG, MEDIUM TO COARSE, ANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, VERY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MANY, THIN CLAY FILMS IN ALL VOIDS/CHANNELS AND ON ALL VERTICAL AND HORIZONTAL PED FACES, 10YR 4/3; WEAKLY CALCAREOUS; WAVY, CLEAR HORIZON BOUNDARY.

2BC: 60 TO 79 CM, RANGE 14 TO 26 CM; HORIZON MOIST; MATRIX MOIST 10YR 3.5/4, MATRIX DRY 10YR 7.5/3; CLAY LOAM; MODERATE, MEDIUM TO COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, MANY, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; 20% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

2CK: 79 TO 120 CM; MATRIX MOIST 2.5Y 4/4, MATRIX DRY 2.5Y 7.5/2; CLAY LOAM; WEAK, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; COMMON, MEDIUM, VERTICAL, IRREGULAR, STREAKED AND SPOTTED SECONDARY CARBONATES WITH FRIABLE CONSISTENCE, 10YR 8/1; 40% GRAVELLY COARSE FRAGMENTS.

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CHEMICAL DATA (SURVEY)

								C.E.C. (ME/100G)		EXCHANGEABLE CATIONS BUFFERED (ME/100G)			
HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	BUFF.	PERM. CHARG	CA	MG	NA	K
AP	7.1	2.79	0.20				2.4	25.0		20.4	3.8	0.1	1.0
AB	7.1	1.06	0.10				3.8	25.0		18.4	4.4	0.1	0.8
BT	7.3	0.66	0.07	0.2			3.4	21.4		17.5	4.6	0.1	0.7
2BC	7.5	0.56	0.06	7.2	1.4	5.4		18.5		18.6	4.9	0.1	0.9
2CK	7.6			12.2	6.9	4.8		23.1		25.6	6.8	0.2	0.9

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.5	47.8
AB	0.3	46.6
BT	0.3	45.4
2BC	0.4	44.7
2CK	0.3	57.2

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

	% PASSING										% OF SAMPLE			
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP				99	1	3	5	8	27	44		34	22	
AB				99	1	2	4	6	11	24		47	29	
BT				99	1	1	3	6	12	23		47	30	
2BC				99	2	5	7	10	12	36		41	23	
2CK				99	6	7	7	8	9	37		39	24	

PHYSICAL DATA

HORIZON	SURVEY (CON'T) MOISTURE STATUS (%) 0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ENGINEERING ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			12.0										
AB			13.0										
BT			12.0			18.0	38.0	16.0		1.9	18.0	60	10
2BC			11.8										
2CK			17.7			28.0	51.0	25.0		1.6	19.0	76	13

KIS MANITOBA 1985 PROFILE NO. 7

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF RECONNAISANCE SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; VERY LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: DARK GRAY LUVISOL. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: KIS, ASSOCIATED SOILS: VOLAND PBI.

LOCATION: MILITARY GRID REF. 14 UNK 3425 8945; NTS MAP AREA 62G 10; NW 8 7 8 W.

CLIMATE: 1425 FEET ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MEDIUM ACID TO NEUTRAL (PH 5.6-7.3), GLACIOLACUSTRINE, MIXED; PARENT MATERIAL 2: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: MORAINAL, CLAYEY, HUMMOCKY; SLOPE: 1.5% SIMPLE SLOPE OF CLASS 2 (0.5-2%), FACING SOUTHEAST, SITE AT UPPER SLOPE POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY,30 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; NONSTONY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: HIGH SHALE CONTENT IN TILL SUBSOIL

AP: 0 TO 23 CM, RANGE 21 TO 27 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2, MATRIX DRY 10YR 5/2; LOAM; MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, FINE, SUBANGULAR BLOCKY AND SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY HARD AND HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS; WAVY, ABRUPT HORIZON BOUNDARY.

AE: 23 TO 36 CM, RANGE 9 TO 14 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3, MATRIX DRY 10YR 7/2; SILT LOAM; VERY WEAK, COARSE, PLATY STRUCTURE; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, VERTICAL, EXPED, CONTINUOUS, SIMPLE, VESICULAR PORES; WAVY, ABRUPT HORIZON BOUNDARY.

AB: 36 TO 50 CM, RANGE 8 TO 30 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/4, MATRIX DRY 10YR 6.5/3; CLAY LOAM; MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, VERY HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MANY, THIN CLAY FILMS ON PED FACES-UNSPECIFIED; CLAY FILMS 10YR 3/3; WAVY, CLEAR HORIZON BOUNDARY.

BT: 50 TO 62 CM, RANGE 3 TO 16 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3.5, MATRIX DRY 10YR 6.5/3; CLAY LOAM; MODERATE TO STRONG, MEDIUM, COLUMNAR STRUCTURE; MODERATE TO STRONG, VERY COARSE, ANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, VERY HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; CONTINUOUS, THIN CLAY FILMS IN ALL VOIDS/CHANNELS AND ON ALL VERTICAL AND HORIZONTAL PED FACES, 10YR 2/2; BROKEN, CLEAR HORIZON BOUNDARY.

BC: 62 TO 70 CM, RANGE 0 TO 10 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/4, MATRIX DRY 10YR 6/4; LOAM; MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; COMMON, THIN CLAY FILMS ON PED FACES-UNSPECIFIED, 10YR 2/2; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; BROKEN, CLEAR HORIZON BOUNDARY.

2BC: 70 TO 88 CM, RANGE 11 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4, MATRIX DRY 10YR 6/4; GRITTY LOAM; MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; COMMON, THIN CLAY FILMS ON PED FACES-UNSPECIFIED, 10YR 2/2; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; 10% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

2CK: 88 TO 140 CM; HORIZON MOIST; MATRIX MOIST 10YR 5.5/4, MATRIX DRY 10YR 7/4; GRITTY LOAM; WEAK TO MODERATE, COARSE, ANGULAR

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BLOCKY STRUCTURE; VERY FRIABLE, NONPLASTIC CONSISTENCE; MODERATELY POROUS, COMMON, FINE, RANDOM, INPED, DISCONTINUOUS, SIMPLE, TUBULAR PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; 20% GRAVELLY COARSE FRAGMENTS.

CHEMICAL DATA (SURVEY)

								C.E.C. (ME/100G)		EXCHANGEABLE CATIONS BUFFERED (ME/100G)			
HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	BUFF.	PERM. CHARG	CA	MG	NA	K
AP	7.1	2.44	0.19				2.2	18.3		12.4	3.4	0.1	0.7
AE	7.1	0.41	0.05				2.8	11.1		6.4	2.0	0.1	0.5
AB	7.0	0.33	0.04				3.6	22.6		14.4	4.3	0.1	0.7
BT	6.9	0.39	0.05				4.0	27.1		16.4	5.7	0.1	0.8
BC	7.4	0.61	0.06	26.3	10.4	14.6		20.0		17.7	4.0	0.2	0.6
2BC	7.4	0.51	0.06	20.6	7.9	11.7		18.0		16.2	4.2	0.1	0.6
2CK	7.5			33.3	17.4	14.7		10.2		17.2	2.1	0.1	0.3

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.5	45.8
AE	0.2	41.1
AB	0.3	43.8
BT	0.3	49.9
BC	0.7	47.0
2BC	0.3	47.4
2CK	0.4	32.3

PHYSICAL DATA (SURVEY)

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	PARTICLE SIZE ANALYSIS V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY	BULK DENS G/CC
AP				98	2	4	5	8	20	39		43	10		0.99
AE				99	1	2	3	5	18	29		53	18		1.45
AB				99	1	2	2	5	12	22		47	31		1.44
BT				99	2	3	4	5	9	23		41	36		1.41
BC				99	1	3	5	9	9	27		48	25		1.66
2BC				98	6	8	9	11	9	43		31	26		1.68
2CK		98	92	89	5	9	11	14	10	49		38	13		1.68

PHYSICAL DATA

HORIZON	SURVEY (CON'T) MOISTURE STATUS (%) 0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ENGINEERING ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			12.3		30.7								
AE			10.7		23.0								
AB			11.1		30.6								
BT			14.0		30.6	21.0	46.0	16.0		1.9	20.6	76	10
BC			12.7		23.6								
2BC			12.7		23.6								
2CK			8.3		17.0	16.0	24.0	20.0		1.8	9.9	40	10

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SPECIAL ANALYTICAL DATA

HORIZON	INFILTRATION (CM) 5 MIN	10 MIN	15 MIN	60 MIN	INFILTRATION RATE, STEADY STATE (CM/HR)	SATURATED. HYDRAULIC CONDUCTIVITY (CM/HR)
AP	0.8			3.1		1.9
AE						
AB						
BT						
BC						
2BC						
2CK						

LRY MANITOBA 1985 PROFILE NO. 9

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF RECONNAISANCE SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: ALKALINE, STRONGLY CALCAREOUS, COOL, SEMIARID. SOIL MAP UNIT: NOTATION: LRY, ASSOCIATED SOILS: VDL.

LOCATION: MILITARY GRID REF. 14 UNK 3740 8960; NTS MAP AREA 62G 9; NE 9 7 8 W.

CLIMATE: 1200 FEET ABOVE MEAN SEA LEVEL.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, STRATIFIED (MINERAL) AND SANDY, MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), GLACIOFLUVIAL, MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, PEBBLY, WASHED, HUMMOCKY; SLOPE: 3.5% COMPLEX SLOPE OF CLASS 3 (2-5%), FACING NORTH, SITE AT UPPER SLOPE POSITION, 90 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, RAPIDLY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: ROAD-CUT GRAVEL MOSTLY PEA-SIZED

AH: 0 TO 12 CM, RANGE 10 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2, MATRIX DRY 10YR 4/1.5; SANDY LOAM; VERY WEAK, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; SINGLE GRAIN SECONDARY STRUCTURE; SOFT, NONPLASTIC CONSISTENCE; PLENTIFUL, FINE, VERTICAL, INPED ROOTS; HIGHLY POROUS, CLOSED, INTERSTITIAL PORES; 30% GRAVELLY COARSE FRAGMENTS; WAVY, GRADUAL HORIZON BOUNDARY.

BTJ: 12 TO 27 CM, RANGE 0 TO 22 CM; HORIZON MOIST; MATRIX MOIST 10YR 2.5/3, MATRIX DRY 10YR 4.5/3; LOAMY COARSE SAND; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY STRUCTURE; SINGLE GRAIN SECONDARY STRUCTURE; SOFT, NONPLASTIC CONSISTENCE; PLENTIFUL, FINE, VERTICAL, INPED ROOTS; HIGHLY POROUS, CLOSED, INTERSTITIAL PORES; COMMON, THIN CLAY FILMS IN MANY VOIDS/CHANNELS AND ON SOME VERTICAL AND HORIZONTAL PED FACES, 10YR 3/3; MODERATELY CALCAREOUS; 30% GRAVELLY COARSE FRAGMENTS; BROKEN, CLEAR HORIZON BOUNDARY.

BC: 27 TO 55 CM, RANGE 20 TO 50 CM; HORIZON DRY; MATRIX MOIST , MATRIX DRY 10YR 4/3; GRAVELLY LOAMY COARSE SAND; SINGLE GRAIN STRUCTURE; LOOSE, NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, CLOSED, INTERSTITIAL PORES; FEW, MEDIUM, SPHERICAL IRON-MANGANESE CONCRETIONS LOCATED LOCAL CONCENTRATIONS (5YR 4/6); MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; 60% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

CK: 55 TO 135 CM; HORIZON DRY; MATRIX MOIST , MATRIX DRY 10YR 6/4; GRAVELLY COARSE SAND; SINGLE GRAIN STRUCTURE; LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS, CLOSED, INTERSTITIAL PORES; COMMON, MEDIUM, SPHERICAL IRON-MANGANESE CONCRETIONS LOCATED LOCAL CONCENTRATIONS (2.5YR 3/4); WEAK EFFERVESCENCE; VERY STRONGLY CALCAREOUS; 50% COARSE FRAGMENTS.

CHEMICAL DATA (SURVEY)

								C.E.C. (ME/100G)		EXCHANGEABLE CATIONS BUFFERED (ME/100G)			
HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	BUFF.	PERM. CHARG	CA	MG	NA	K
AH	7.3	1.64	0.13				1.0	12.3		8.3	2.6	0.1	0.3
BTJ	7.4	0.83	0.06	8.6	0.8	7.3		7.3		6.0	1.8	0.1	0.1
BC	7.6	0.80	0.07	13.2	4.8	7.8		8.3		7.6	1.7	0.1	0.1
CK	7.7			20.9	12.1	8.1		1.7		9.7	0.6	0.1	0.1

LRY MANITOBA 1985 PROFILE NO. 9

AUG 18, 1986

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AH	0.4	28.1
BTJ	1.7	25.7
BC	0.5	32.4
CK	0.2	32.4

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

	% PASSING										% OF SAMPLE			
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AH		99	93	87	7	8	38	11	5	79		12	9	
BTJ		99	92	84	7	27	41	7	3	85		9	6	
BC		99	55	41	4	21	46	13	3	87		7	6	
CK		95	66	51	13	31	39	12	2	97		3	0	

PHYSICAL DATA

ENGINEERING

HORIZON	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AH								
BTJ							12	07
BC								
CK							12	06

FND MANITOBA 1985 PROFILE NO. 10

IDENTIFICATION: SURVEYED BY ES, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC BLACK. MINERAL SOIL FAMILY: COARSE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: FND, ASSOCIATED SOILS: DRNAND GBO. SOIL PHASES: VERY GENTLY SLOPING AND NONSTONY AND NONROCKY.

LOCATION: MILITARY GRID REF. 14 UNL 1885 220; NTS MAP AREA 62G 10; MUNICIPALITY SNKNE 22 08 10 W.

CLIMATE: 362 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, COARSE LOAMY AND COARSE SILTY (<18% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE; LANDFORM CLASSIFICATION: LACUSTRINE, LOAMY, UNDULATING; SLOPE: 3.5% SIMPLE SLOPE OF CLASS 3 (2-5%), FACING SOUTH, SITE AT UPPER SLOPE POSITION; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 2/T.

AP: 0 TO 20 CM, RANGE 18 TO 21 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 2.5/1; VERY FINE SANDY LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; PLENTIFUL, FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; SMOOTH, ABRUPT HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

AH: 20 TO 27 CM, RANGE 5 TO 9 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/2; VERY FINE SANDY LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; PLENTIFUL, FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; WAVY, DIFFUSE HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

BM: 27 TO 47 CM, RANGE 16 TO 24 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/2, MATRIX DRY 10YR 3/3; VERY FINE SANDY LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; PLENTIFUL, FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; WAVY, GRADUAL HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

BC: 47 TO 52 CM, RANGE 4 TO 7 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3, MATRIX DRY 10YR 4/3; VERY FINE SANDY LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; PLENTIFUL, FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; MODERATELY CALCAREOUS; WAVY, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

CK: 52 TO 85 CM, RANGE 29 TO 40 CM; HORIZON MOIST; MATRIX MOIST 10YR 4.5/3, MATRIX DRY 10YR 5.5/3; VERY FINE SANDY LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; STRONG EFFERVESCENCE; STRONGLY CALCAREOUS; SMOOTH, DIFFUSE HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKGJ1: 85 TO 100 CM, RANGE 13 TO 17 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 6/4, MATRIX DRY 2.5Y 6/4; VERY FINE SANDY LOAM; FEW, FINE, DISTINCT, 2.5YR 5/6 MOTTLES; WEAK, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; STRUCTURELESS, VERY FINE TO FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; VERY FEW, VERY FINE, VERTICAL, INPED ROOTS; HIGHLY POROUS, MANY, FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; STRONG EFFERVESCENCE; MODERATELY CALCAREOUS; WAVY, DIFFUSE HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKGJ2: 100 TO 120 CM; HORIZON MOIST; 2.5Y 5/4, MATRIX DRY 2.5Y 6.5/4; SILT LOAM; COMMON, MEDIUM, PROMINENT, 10R 4/6 MOTTLES; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, COMMON, FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, TUBULAR PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	6.5	2.03	0.10				3.6	19.2		12.6	3.1	0.1	0.4
AH	7.0	1.19	0.10				3.2		17.6	11.1	3.4	0.1	0.3
BM	7.1	0.86	0.08				2.8	13.7		10.1	3.6	0.1	0.3
BC	7.5	0.73	0.07	5.7	1.0	4.4		13.0		13.0	3.3	0.1	0.3
CK	7.7			17.7	8.3	8.0		10.6		19.3	3.5	0.1	0.2
CKGJ1	7.7			13.4	4.6	8.1		7.7		14.1	2.9	0.1	0.2
CKGJ2	7.7			27.3	9.8	16.1		14.4		21.6	5.6	0.2	0.4

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.3	44.3
AH	0.3	41.3
BM	0.3	42.3
BC	0.7	43.2
CK	0.3	38.8
CKGJ1	0.3	32.3
CKGJ2	0.7	44.3

AUG 18, 1986

FND MANITOBA 1985 PROFILE NO. 10

PHYSICAL DATA (SURVEY)

	PARTICLE SIZE ANALYSIS														
	% PASSING				% OF SAMPLE										
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY	BULK DENS G/CC
AP				99			1	30	36	67		18	15		1.10
AH				99				29	29	58		24	18		1.41
BM				99				21	37	58		25	17		1.34
BC				99				26	27	53		32	15		1.34
CK				99				21	33	54		29	17		1.45
CKGJ1				99				21	56	77		14	9		1.45
CKGJ2				99				2	24	26		57	17		1.42

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			7.3		22.6								
AH			7.3		20.6								
BM			6.8		19.5								
BC			5.9		19.5								
CK			5.2		17.8	20.0	25.0	21.0		1.7	9.4	40	19
CKGJ1			5.2		17.8								
CKGJ2					18.0	21.0	32.0	23.0		1.7	13.7	60	10

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FND MANITOBA 1985 PROFILE NO. 10

SPECIAL ANALYTICAL DATA

HORIZON	INFILTRATION (CM) 5 MIN	10 MIN	15 MIN	60 MIN	INFILTRATION RATE, STEADY STATE (CM/HR)	SATURATED. HYDRAULIC CONDUCTIVITY (CM/HR)
AP	1.6			5.7		3.2
AH						
BM						
BC						
CK						
CKGJ1						
CKGJ2						

DZW MANITOBA 1984 PROFILE NO. 21

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; EXTENSIVE; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: NOTATION: DZW.

LOCATION: MILITARY GRID REF. 14 UNK 660 7815; NTS MAP AREA 62G ; NE 5 6 11 W.

CLIMATE: 442 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: MORAINAL, LOAMY, HUMMOCKY; SLOPE: 3% COMPLEX SLOPE OF CLASS 3 (2-5%), FACING WEST, SITE AT UPPER SLOPE POSITION, LEVEL MICROTOPOGRAPHY,110 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; SLIGHTLY STONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: SLIGHTLY ERODED PROFILE

AP: 0 TO 20 CM, RANGE 20 TO 23 CM; HORIZON DRY; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 4/1.5; LOAM; MODERATE TO STRONG, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FRIABLE, VERY HARD, PLASTIC CONSISTENCE; 10% GRAVELLY COARSE FRAGMENTS; SMOOTH, ABRUPT HORIZON BOUNDARY.

BT: 20 TO 55 CM, RANGE 25 TO 40 CM; HORIZON MOIST; MATRIX MOIST 10YR 4.5/2, MATRIX DRY 10YR 6/3; CLAY LOAM; STRONG, COARSE, COLUMNAR STRUCTURE; STRONG, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FIRM, VERY HARD, PLASTIC CONSISTENCE; CONTINUOUS, VERY THIN CLAY FILMS IN MANY VOIDS/CHANNELS AND ON SOME VERTICAL AND HORIZONTAL PED FACES, 10YR 3/2; 10% GRAVELLY COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY.

CK: 55 TO 90 CM; HORIZON MOIST; MATRIX MOIST 5YR 4/2, MATRIX DRY 10YR 7/2; LOAM; MODERATE TO STRONG, MEDIUM, COLUMNAR STRUCTURE; STRONG, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FRIABLE, VERY HARD, PLASTIC CONSISTENCE; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; 10% GRAVELLY COARSE FRAGMENTS.

CHEMICAL DATA (SURVEY)

								C.E.C. (ME/100G)		EXCHANGEABLE CATIONS BUFFERED (ME/100G)			
HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	BUFF.	PERM. CHARG	CA	MG	NA	K
AP	6.6	3.29	0.24				5.2	31.3		19.7	4.7		0.9
BT	7.4	0.55	0.07				4.8	29.6		15.9	6.7	0.1	0.9
CK	7.5			11.9	6.6	5.1		25.3		25.3	6.7	0.2	0.7

DZW MANITOBA 1984 PROFILE NO. 21

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.8	56.9
BT	0.4	59.6
CK	0.5	55.6

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

	% PASSING				% OF SAMPLE									
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP					2	5	8	11	15	41		34	25	
BT				95	2	5	8	13	12	40		29	31	
CK				98	3	6	9	10	12	40		33	27	

PHYSICAL DATA

	SURVEY (CON'T) MOISTURE STATUS (%)					ENGINEERING							
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			15.4										
BT			18.7			25.0	50.0	22.0		1.7	17.0	76	10
CK			17.9			25.0	45.0	22.0		1.6	16.0	76	10

HOS MANITOBA 1984 PROFILE NO. 22

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; VERY LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: REGO HUMIC GLEYSOL. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COLD, AQUIC. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: HOS.

LOCATION: MILITARY GRID REF. 14 UNK 645 7815; NTS MAP AREA 62G *; NE 5 6 11 W.

CLIMATE: 442 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: GRASSES AND FORBES, CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: MORAINAL, LOAMY, LEVEL; SLOPE: 0.5% SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING NORTH, SITE AT DEPRESSION POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY,70 M LONG; SOIL MOISTURE AND DRAINAGE: AQUIC, POORLY DRAINED, MODERATELY PERVIOUS, VERY SLOW SURFACE RUNOFF, SEEPAGE ABSENT; SLIGHTLY STONY; NONROCKY; PRESENT LAND USE: NATURAL GRAZING.

SPECIAL NOTES: SITE LOCATED IN SMALL GRASSED RUN, SALINE PHASEEC OF A 14.8,AC 12.1 AND C 7.5 MMHOS/CM

APKS: 0 TO 18 CM, RANGE 16 TO 22 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 3/1; CLAY LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, VERY FINE TO FINE, GRANULAR SECONDARY STRUCTURE; STICKY, FRIABLE, HARD, PLASTIC CONSISTENCE; MODERATE EFFERVESCENCE; WEAKLY CALCAREOUS; WEAKLY SALINE; 10% COARSE FRAGMENTS; WAVY, GRADUAL HORIZON BOUNDARY.

AC: 18 TO 36 CM, RANGE 15 TO 21 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5/4; SILT LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FRIABLE, HARD, PLASTIC CONSISTENCE; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; MODERATELY SALINE; 10% COARSE FRAGMENTS; WAVY, GRADUAL HORIZON BOUNDARY.

CKGS: 36 TO 100 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 6/2; CLAY LOAM; MANY, MEDIUM, PROMINENT, 5YR 5/6 MOTTLES; MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FIRM, HARD, PLASTIC CONSISTENCE; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; MODERATELY SALINE; 10% GRAVELLY COARSE FRAGMENTS.

CHEMICAL DATA (SURVEY)

							C.E.C. (ME/100G)		EXCHANGEABLE CATIONS BUFFERED (ME/100G)			
HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	BUFF.	PERM. CHARG	CA	MG	NA	K
APKS	7.6	3.18	0.31	2.3	0.5	1.7	34.3		78.9	18.3	14.8	1.2
AC	8.0	0.56	0.01	10.3	2.8	7.0	25.2		33.5	13.9	13.4	0.9
CKGS	8.1			19.6	7.6	11.1	16.8		19.7	8.5	10.5	0.3

HOS MANITOBA 1984 PROFILE NO. 22

AUG 18, 1986

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APKS	14.8	86.7
AC	12.1	81.7
CKGS	7.5	97.0

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

	% PASSING										% OF SAMPLE			
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APKS						2	4	5	9	20		45	35	
AC						1	2	2	7	12		70	18	
CKGS					4	6	9	13	9	41		28	31	

PHYSICAL DATA

	SURVEY (CON'T)							ENGINEERING					
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APKS			21.0										
AC			13.8			17.0	46.0	17.0		1.9	22.0	76	10
CKGS			14.1			13.0	36.0	14.0		1.9	21.0	60	10

PDA MANITOBA 1984 PROFILE NO. 23

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; DEVIATION(S): TEXTURE; VERY LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, PERHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: PDA, ASSOCIATED SOILS: FIRAND TDP.

LOCATION: MILITARY GRID REF. 14 UNK 1625 6670; NTS MAP AREA 62G *; SE 5 5 10 W.

CLIMATE: 450 METERS ABOVE MEAN SEA LEVEL. SOIL TEMP READING NO. 1 WAS 4 DEG(C) AT 15 CM IN SEPTEMBER, NO. 2 WAS 4 DEG(C) AT 35 CM IN SEPTEMBER, NO. 3 WAS 8 DEG(C) AT 100 CM IN SEPTEMBER.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE; LANDFORM CLASSIFICATION: LACUSTRINE, SILTY, ROLLING; SLOPE: 0.5% SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING EAST, SITE AT TOE POSITION, LEVEL MICROTOPOGRAPHY,70 M LONG; SOIL MOISTURE AND DRAINAGE: PERHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: SHALE TILL AT 130 CM. WETTING FRONT TO 70 CM.

APK: 0 TO 24 CM, RANGE 22 TO 28 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/1; SILTY CLAY LOAM; MODERATE TO STRONG, VERY COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, FINE, GRANULAR SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, EXPED, CONTINUOUS, DENDRITIC, VESICULAR PORES; MODERATE EFFERVESCENCE; WEAKLY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY.

AC: 24 TO 46 CM, RANGE 16 TO 22 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/1, MATRIX DRY 2.5Y 5/2; SILTY CLAY; WEAK, VERY COARSE, PLATY STRUCTURE PSEUDO; WEAK, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, INPED AND EXPED, CONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; WAVY, GRADUAL HORIZON BOUNDARY.

CKGJ: 46 TO 130 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5.5/4, MATRIX DRY 2.5Y 6.5/3; SILT LOAM; FEW, FINE, FAINT, 2.5Y 5/4 MOTTLES; WEAK, FINE TO MEDIUM STRUCTURE PSEUDO; WEAK, MEDIUM, GRANULAR SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD, PLASTIC CONSISTENCE; VERY FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, CONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; VERTICAL SECONDARY CARBONATES WITH SLIGHTLY HARD CONSISTENCE, 10YR 8/2.

CHEMICAL DATA (SURVEY)

							C.E.C. (ME/100G)		EXCHANGEABLE CATIONS BUFFERED (ME/100G)			
HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	BUFF.	PERM. CHARG	CA	MG	NA	K
APK	7.5	4.66	0.40	4.9	3.1	1.6	37.4		36.8	7.9	0.3	1.2
AC	7.5	1.46	0.14	21.7	17.2	4.2	21.0		26.8	7.4	0.4	0.6
CKGJ	7.6			18.6	2.7	14.6	17.4		18.3	6.6	0.5	0.7

PDA MANITOBA 1984 PROFILE NO. 23

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APK	0.8	72.8
AC	1.6	62.2
CKGJ	0.7	55.8

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

	% PASSING										% OF SAMPLE			
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APK						2	1	2	9	14		53	33	
AC						1	1	1	8	11		47	42	
CKGJ										9		67	24	

PHYSICAL DATA

	SURVEY (CON'T)							ENGINEERING					
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APK			18.5										
AC			16.2			21.0	46.0	20.0		1.8	23.0	76	10
CKGJ			12.8			22.0	37.0	32.0		1.7	12.0	60	10

FIR MANITOBA 1984 PROFILE NO. 24

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: NOTATION: FIR.

LOCATION: MILITARY GRID REF. 14 UNK 1405 6915; NTS MAP AREA 62G *; NW 7 5 10 W.

CLIMATE: 457 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE; LANDFORM CLASSIFICATION: LACUSTRINE, SILTY, ROLLING; SLOPE: 1% SIMPLE SLOPE OF CLASS 2 (0.5-2%), FACING WEST, SITE AT UPPER SLOPE POSITION, LEVEL MICROTOPOGRAPHY,105 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SLIGHT WATER EROSION; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

AP: 0 TO 22 CM, RANGE 17 TO 25 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 4/2; CLAY LOAM; WEAK, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, INPED AND EXPED, CONTINUOUS, DENDRITIC, VESICULAR PORES; SMOOTH, ABRUPT HORIZON BOUNDARY.

BT: 22 TO 40 CM, RANGE 17 TO 24 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3, MATRIX DRY 10YR 5.5/3; SILTY CLAY LOAM; WEAK, COARSE, COLUMNAR STRUCTURE; MODERATE TO STRONG, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; MANY, THIN CLAY FILMS IN ALL VOIDS/CHANNELS AND ON ALL VERTICAL AND HORIZONTAL PED FACES, 10R 3/2; WAVY, ABRUPT HORIZON BOUNDARY.

CCA: 40 TO 50 CM, RANGE 4 TO 18 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4.5/3.5, MATRIX DRY 10YR 7/2; SILTY CLAY LOAM; WEAK, MEDIUM, PLATY STRUCTURE PSEUDO; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; WAVY, CLEAR HORIZON BOUNDARY.

CK: 50 TO 190 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4.5/4, MATRIX DRY 10YR 7/3; SILT LOAM; WEAK TO MODERATE, MEDIUM, PLATY STRUCTURE PSEUDO; WEAK, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE, RANDOM, INPED AND EXPED, DISCONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; COMMON, MEDIUM, RANDOM, ROUNDED, SPOTTED SECONDARY CARBONATES WITH FRIABLE CONSISTENCE, 10YR 7/3.

CHEMICAL DATA (SURVEY)

								C.E.C. (ME/100G)		EXCHANGEABLE CATIONS BUFFERED (ME/100G)			
HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	BUFF.	PERM. CHARG	CA	MG	NA	K
AP	7.2	3.87	0.27				3.3	32.5		25.1	6.3	0.1	1.4
BT	7.5	0.67	0.01				3.5	28.2		19.6	7.2	0.1	1.0
CCA	7.7			30.2	17.2	12.3		20.4		23.1	6.9	0.1	0.7
CK	7.7			23.4	7.6	14.6		18.3		21.3	8.6	0.2	0.7

AUG 18, 1986

FIR MANITOBA 1984 PROFILE NO. 24

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.9	63.6
BT	0.5	64.1
CCA	0.5	60.5
CK	0.5	66.9

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

	% PASSING									% OF SAMPLE					
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY	BULK DENS G/CC
AP						1	1	1	7	10		63	27		1.02
BT										5		61	34		1.30
CCA										2		67	31		1.25
CK										2		82	16		1.32

PHYSICAL DATA

	SURVEY (CON'T) MOISTURE STATUS (%)					ENGINEERING							
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			14.7		32.6								
BT			14.0		26.6	21.0	46.0	17.0		1.9	20.0	76	10
CCA			13.2		24.8								
CK			16.0		24.2	27.0	44.0	30.0		1.5	14.0	76	10

SPECIAL ANALYTICAL DATA

HORIZON	INFILTRATION (CM) 5 MIN	 10 MIN	 15 MIN	 60 MIN	INFILTRATION RATE, STEADY STATE (CM/HR)	SATURATED. HYDRAULIC CONDUCTIVITY (CM/HR)
AP	1.0			4.6	3.8	8.0
BT						
CCA						17.2
CK						

AUG 18, 1986

DZW MANITOBA 1984 PROFILE NO. 25

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; EXTENSIVE; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: NOTATION: DZW, ASSOCIATED SOILS: FFR.

LOCATION: MILITARY GRID REF. 14 UNK 2825 8060; NTS MAP AREA 62G *; SW 15 6 9 W.

CLIMATE: 472 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; PARENT MATERIAL 2: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), SHALE; LANDFORM CLASSIFICATION: INACTIVE MORAINAL, LOAMY, KETTLED, HUMMOCKY; SLOPE: 4% SIMPLE SLOPE OF CLASS 3 (2-5%), FACING SOUTHEAST, SITE AT UPPER SLOPE POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY,130 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: THREE ANIMAL BURROUGHS IN CCA,PROFILE HAS DOMINANTLY SHALE TILL AT 80 CM WHICH MAKES THIS SITE A VARIANT OF THE TYPICAL DEZWOOD DEVELOPED IN DEEP REGIONAL TILL, SHALE FRAGMENTS IN 2C GROUND DOWN BY LAB MAKING TEXTURAL ERROR.

AP: 0 TO 20 CM, RANGE 18 TO 24 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 4/2; LOAM; MODERATE TO STRONG, VERY COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE TO STRONG, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FRIABLE, VERY HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, INPED AND EXPED ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, INPED AND EXPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 10% GRAVELLY COARSE FRAGMENTS; SMOOTH, ABRUPT HORIZON BOUNDARY.

BTJ: 20 TO 30 CM, RANGE 5 TO 12 CM; HORIZON MOIST; MATRIX MOIST 10YR 3.5/2, MATRIX DRY 10YR 6.5/3; CLAY LOAM; WEAK, COARSE, COLUMNAR STRUCTURE; MODERATE TO STRONG, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FIRM, VERY HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, VERY FEW, FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; CONTINUOUS, VERY THIN CLAY FILMS IN ALL VOIDS/CHANNELS AND ON ALL VERTICAL AND HORIZONTAL PED FACES, 10YR 3/2; 10% GRAVELLY COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY.

BT: 30 TO 45 CM, RANGE 8 TO 22 CM; HORIZON MOIST; MATRIX MOIST 10YR 4.5/2, MATRIX DRY 10YR 6/3; CLAY LOAM; STRONG, COARSE, COLUMNAR STRUCTURE; STRONG, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FIRM, VERY HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; CONTINUOUS, THIN CLAY FILMS IN ALL VOIDS/CHANNELS AND ON ALL VERTICAL AND HORIZONTAL PED FACES, 10YR 3/2; 10% GRAVELLY COARSE FRAGMENTS; WAVY, GRADUAL HORIZON BOUNDARY.

CCA: 45 TO 80 CM, RANGE 30 TO 38 CM; HORIZON DRY; MATRIX MOIST 10YR 7/2, MATRIX DRY 10YR 8/2; LOAM; WEAK, MEDIUM, COLUMNAR STRUCTURE; STRONG, COARSE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; MANY, COARSE, RANDOM, IRREGULAR, HOMOGENEOUS SECONDARY CARBONATES WITH FRIABLE , AND LOOSE CONSISTENCE, 10YR 8/2; 10% GRAVELLY COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY.

2CK: 80 TO 105 CM; HORIZON DRY; MATRIX MOIST 5YR 4/2.5, MATRIX DRY 10YR 8/1; LOAM; STRONG, MEDIUM, PLATY STRUCTURE PSEUDO; STRONG, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; HIGHLY POROUS, MANY, FINE, HORIZONTAL, EXPED, DISCONTINUOUS, SIMPLE, INTERSTITIAL PORES; VERY WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; 50% SHALY COARSE FRAGMENTS.

AUG 18, 1986

DZW MANITOBA 1984 PROFILE NO. 25

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	6.4	3.39	0.24				5.0	31.7		22.1	4.1	0.1	0.8
BTJ	7.0	0.80	0.08				3.0	24.2		17.2	4.0	0.1	0.8
BT	7.3	0.75	0.08				3.8	27.4		22.2	5.9	0.1	0.8
CCA	7.6			24.2	16.6	7.0		15.0		23.1	4.5	0.1	0.5
2CK	7.6			7.8	6.4	1.3		33.4		28.1	8.0	0.4	1.3

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.5	60.5
BTJ	0.6	53.0
BT	0.4	59.7
CCA	0.6	46.1
2CK	0.7	69.3

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	% OF SAMPLE V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY	BULK DENS G/CC
AP					1	3	5	7	11	27		47	26		1.27
BTJ					1	3	5	7	10	26		45	29		1.38
BT					1	2	5	8	7	23		44	33		1.40
CCA				90	2	5	10	14	9	40		35	25		1.12
2CK				50	4	8	7	9	7	35		40	25		1.11

DZW MANITOBA 1984 PROFILE NO. 25

AUG 18, 1986

PHYSICAL DATA

	SURVEY (CON'T)							ENGINEERING					
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP		38.9	15.0		29.8								
BTJ		32.6	12.5		25.7								
BT		35.2	15.7		23.2	20.0	43.0	16.0		1.8	18.0	76	10
CCA		29.0	10.3		28.6								
2CK		41.6	21.8		32.2	37.0	61.0	34.0		1.4	15.0	75	12

SPECIAL ANALYTICAL DATA

	INFILTRATION (CM)					
HORIZON	5 MIN	10 MIN	15 MIN	60 MIN	INFILTRATION RATE, STEADY STATE (CM/HR)	SATURATED. HYDRAULIC CONDUCTIVITY (CM/HR)
AP	1.1		2.1	4.9	3.1	5.3
BTJ						3.2
BT						
CCA						
2CK						

NYO MANITOBA 1984 PROFILE NO. 26

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: DARK GRAY LUVISOL. MINERAL SOIL FAMILY: CLAYEY, NEUTRAL, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: NYO, ASSOCIATED SOILS: FFRAND DZN.

LOCATION: MILITARY GRID REF. 14 UNK 2910 7840; NTS MAP AREA 62G ; NE 3 06 9 W.

CLIMATE: 488 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, CLAYEY (>35% CLAY), MEDIUM ACID TO NEUTRAL (PH 5.6-7.3), MORAINAL (TILL), SHALE; LANDFORM CLASSIFICATION: INACTIVE MORAINAL, LOAMY, ERODED(CHANNELLED), HUMMOCKY; SLOPE: 10% SIMPLE SLOPE OF CLASS 5 (10-15%), FACING EAST, SITE AT UPPER SLOPE POSITION, LEVEL MICROTOPOGRAPHY,350 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, RAPIDLY PERVIOUS, RAPID SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: VARIABLE C HORIZON WITH CLAYEY AND SHALE AREAS. ALSO WAXY COATING WAS FOUND IN THE BT 7.5 YR 5/6. A 15 CM BAND OF SHALE RUNS DIAGONALLY THROUGH THE BT HORIZONS.

AP: 0 TO 15 CM, RANGE 12 TO 18 CM; HORIZON MOIST; MATRIX MOIST 10YR 3.5/2, MATRIX DRY 10YR 5/2; SILT LOAM; MODERATE TO STRONG, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE TO STRONG, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, INPED AND EXPED ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, INPED AND EXPED, CONTINUOUS, SIMPLE, VESICULAR PORES; GRAVELLY AND SHALY COARSE FRAGMENTS; SMOOTH, ABRUPT HORIZON BOUNDARY.

AE1: 15 TO 22 CM, RANGE 4 TO 10 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4.5/4, MATRIX DRY ; SILT LOAM; VERY WEAK, MEDIUM, COLUMNAR STRUCTURE; MODERATE TO STRONG, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; GRAVELLY AND SHALY COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY.

AE2: 22 TO 46 CM, RANGE 18 TO 24 CM; HORIZON DRY; MATRIX MOIST 2.5Y 4/4, MATRIX DRY ; SILT LOAM; WEAK, FINE, PLATY STRUCTURE; MODERATE TO STRONG, MEDIUM, GRANULAR SECONDARY STRUCTURE; SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, MEDIUM, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 40% GRAVELLY AND SHALY COARSE FRAGMENTS; SMOOTH, ABRUPT HORIZON BOUNDARY.

BT: 46 TO 110 CM, RANGE 20 TO 70 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/3, MATRIX DRY 2.5Y 6/2; SILTY CLAY; STRONG, MEDIUM, COLUMNAR STRUCTURE; STRONG, MEDIUM TO COARSE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FIRM, VERY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; SLIGHTLY POROUS, FEW, MEDIUM, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; CONTINUOUS, MODERATELY THICK CLAY FILMS IN ALL VOIDS/CHANNELS AND ON ALL VERTICAL AND HORIZONTAL PED FACES, 10YR 3/2; 40% CHANNERY AND SHALY COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY.

C1: 110 TO 135 CM; HORIZON DRY; MATRIX MOIST 2.5Y 3/3, MATRIX DRY ; GRITTY LOAM; MODERATE, COARSE, PLATY STRUCTURE PSEUDO; WEAK, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, FEW, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 50% SHALY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

C2: 135 TO 190 CM; HORIZON DRY; MATRIX MOIST 2.5Y 4/4, MATRIX DRY ; SILTY CLAY LOAM; SLIGHTLY HARD, PLASTIC CONSISTENCE; MODERATELY POROUS; 50% SHALY COARSE FRAGMENTS.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	5.9	2.63	0.22	8.1	33.6		16.9	5.8	0.1	1.6
AE1	6.5	0.72	0.07	5.7	23.1		11.4	5.5	0.1	1.3
AE2	6.3	0.49	0.07	6.1	24.5		11.0	6.9	0.1	1.3
BT	5.2	0.85	0.10	10.3	37.6		16.2	8.5	0.3	1.0
C1	5.6			9.2	40.5		18.0	9.1	0.2	1.4
C2	6.0			7.2	33.7		16.3	8.6	0.5	1.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.2	67.1
AE1	0.3	57.7
AE2	0.3	49.3
BT	0.3	76.3
C1	0.2	70.7
C2	0.3	77.7

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

	% PASSING										% OF SAMPLE			
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP					1	3	4	4	10	22		55	23	
AE1					2	4	5	5	7	23		51	26	
AE2		99	78	60	1	3	4	5	10	23		54	23	
BT		99	76	63	1	3	4	3	2	13		42	45	
C1		87	64	49	6	10	6	5	4	31		44	25	
C2		99	70	50						1		61	38	

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING								
	MOISTURE STATUS (%)													
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			21.8										
AE1			15.9										
AE2			17.6			28.0	41.0	25.0		1.5	10.0	76	09
BT			26.5			37.0	70.0	29.0		1.6	19.0	75	12
C1			28.2			40.0	65.0	37.0		1.3	14.0	75	04
C2			29.9			41.0	66.0	38.0		1.3	15.0	75	12

AUG 18, 1986

DGF MANITOBA 1984 PROFILE NO. 27

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ELUVIATED BLACK. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: NOTATION: DGF.

LOCATION: MILITARY GRID REF. 14 UNK 2820 7395; NTS MAP AREA 62G *; SW 27 5 9 W.

CLIMATE: 480 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: MORAINAL, LOAMY, ROLLING; SLOPE: 2% SIMPLE SLOPE OF CLASS 3 (2-5%), FACING SOUTH, SITE AT UPPER SLOPE POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY,150 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: BT IS QUITE WELL DEVELOPED FOR ORTHIC BLACK MORE CLOSELY RESEMBLES ELUVIATED BLACK WHICH IS COMMON FOR DGF IN AREA. COULD BE WATER-MODIFIED

AP: 0 TO 18 CM, RANGE 15 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2.5/1.5, MATRIX DRY 10YR 3.5/1; CLAY LOAM; WEAK TO MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD CONSISTENCE; FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS; 20% GRAVELLY COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY.

AHE: 18 TO 30 CM, RANGE 6 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/1.5, MATRIX DRY 10YR 4/2; CLAY LOAM; MEDIUM, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, FEW, FINE, VERTICAL, INPED AND EXPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 10% GRAVELLY COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY.

BTJ1: 30 TO 45 CM, RANGE 8 TO 22 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3, MATRIX DRY 10YR 5/3; CLAY LOAM; MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, HARD CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; MANY, VERY THIN CLAY FILMS IN MANY VOIDS/CHANNELS AND ON SOME VERTICAL AND HORIZONTAL PED FACES, 10YR 3/2; 10% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

BTJ2: 45 TO 56 CM, RANGE 4 TO 12 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/4, MATRIX DRY 10YR 5.5/3; CLAY LOAM; MODERATE AND STRONG, MEDIUM, COLUMNAR STRUCTURE; STRONG, MEDIUM, ANGULAR BLOCKY SECONDARY STRUCTURE; FIRM, HARD CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; SLIGHTLY POROUS, COMMON, VERY FINE, RANDOM, INPED, DISCONTINUOUS, SIMPLE, VESICULAR PORES; THIN CLAY FILMS 10YR 3/2; 10% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

CCAJ: 56 TO 75 CM, RANGE 10 TO 27 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/3, MATRIX DRY 10YR 7/2; CLAY LOAM; MEDIUM, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD CONSISTENCE; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; CONTINUOUS, CLAY FILMS IN ALL VOIDS/CHANNELS AND ON ALL VERTICAL AND HORIZONTAL PED FACES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; 10% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

CK: 75 TO 100 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/4, MATRIX DRY 2.5Y 7/3; CLAY LOAM; WEAK AND MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD CONSISTENCE; MODERATELY POROUS, FEW, VERY FINE, VERTICAL, INPED, DISCONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; 20% AND 40% SHALY COARSE FRAGMENTS.

DGF MANITOBA 1984 PROFILE NO. 27

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	5.6	4.13	0.32				9.2	39.4		21.6	6.5	0.1	0.9
AHE	5.7	2.06	0.18				6.4	31.3		17.4	7.0	0.1	0.5
BTJ1	6.6	0.81	0.01				5.3	24.6		14.8	7.1	0.1	0.6
BTJ2	6.7	0.77	0.01				5.1	28.1		18.1	8.1	0.1	0.7
CCAJ	7.6			12.0	9.7	2.2		28.2		29.5	7.9	0.3	0.6
CK	7.7			10.4	7.9	2.2		30.1		28.2	8.2	0.4	0.8

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.2	71.9
AHE	0.2	63.6
BTJ1	0.2	52.6
BTJ2	0.3	55.2
CCAJ	0.5	63.3
CK	0.5	61.5

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	% OF SAMPLE V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY	BULK DENS G/CC
AP					2	3	5	6	7	23		46	31		1.18
AHE				98	2	2	4	5	7	20		45	35		1.35
BTJ1				98	1	3	5	6	11	26		43	31		1.30
BTJ2				98	2	2	4	6	7	21		40	39		1.16
CCAJ				98	2	4	3	10	7	31		39	30		1.16
CK				80	1	5	7	8	6	27		45	28		1.18

PHYSICAL DATA

	SURVEY (CON'T)							ENGINEERING					
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP		41.7	17.7		31.7								
AHE		39.1	15.0		26.1								
BTJ1		30.2	12.2		31.0								
BTJ2		28.7	13.2		31.6	20.0	45.0	16.0		1.9	17.0	76	10
CCAJ		39.0	18.0		31.6								
CK		35.3	19.3		32.1	32.0	50.0	26.0		1.5	16.0	75	09

SPECIAL ANALYTICAL DATA

	INFILTRATION (CM)					
HORIZON	5 MIN	10 MIN	15 MIN	60 MIN	INFILTRATION RATE, STEADY STATE (CM/HR)	SATURATED. HYDRAULIC CONDUCTIVITY (CM/HR)
AP	1.3		2.0	4.3	3.2	8.1
AHE						3.1
BTJ1						5.8
BTJ2						
CCAJ						
CK						

PBI MANITOBA 1984 PROFILE NO. 28

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: DARK GRAY LUVISOL. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: PBI, ASSOCIATED SOILS: DEZ.

LOCATION: MILITARY GRID REF. 14 UNK 890 7615; NTS MAP AREA 62G ; NW 34 5 11 W.

CLIMATE: 457 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: INACTIVE MORAINAL, LOAMY, ERODED(CHANNELLED), HUMMOCKY; SLOPE: 7% COMPLEX SLOPE OF CLASS 4 (6-9%), FACING NORTH, SITE AT UPPER SLOPE POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY,100 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, SLIGHT WATER EROSION; SLIGHTLY STONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: SOLUM THICKNESS VARIABLE IN AREA DUE TO EROSION

AP: 0 TO 20 CM, RANGE 18 TO 22 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/1.5, MATRIX DRY 10YR 4.5/2; LOAM; WEAK, COARSE, PLATY STRUCTURE PSEUDO; MODERATE, COARSE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 10% GRAVELLY COARSE FRAGMENTS; SMOOTH, ABRUPT HORIZON BOUNDARY.

AE: 20 TO 28 CM, RANGE 4 TO 14 CM; HORIZON MOIST; MATRIX MOIST 10YR 4.5/3, MATRIX DRY 10YR 6.5/2; LOAM; WEAK TO MODERATE, MEDIUM, PLATY STRUCTURE; WEAK, FINE, PLATY SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 10% GRAVELLY COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY.

AB: 28 TO 36 CM, RANGE 0 TO 30 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/3, MATRIX DRY 10YR 6.5/3; LOAM; WEAK, MEDIUM, COLUMNAR STRUCTURE; STRONG, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FIRM, HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; COMMON, THIN CLAY FILMS IN MANY VOIDS/CHANNELS AND ON SOME VERTICAL AND HORIZONTAL PED FACES; 10% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

BT: 36 TO 60 CM, RANGE 7 TO 38 CM; HORIZON DRY; MATRIX MOIST 10YR 5/5, MATRIX DRY 10YR 7/4; GRITTY CLAY LOAM; STRONG, COARSE, COLUMNAR STRUCTURE; STRONG, MEDIUM TO COARSE, ANGULAR BLOCKY SECONDARY STRUCTURE; VERY FIRM, VERY HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; CONTINUOUS, MODERATELY THICK CLAY FILMS IN ALL VOIDS/CHANNELS AND ON ALL VERTICAL AND HORIZONTAL PED FACES, 10YR 2/2; 20% GRAVELLY COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY.

CCA: 60 TO 82 CM, RANGE 5 TO 35 CM; HORIZON DRY; MATRIX MOIST 2.5Y 5/4, MATRIX DRY 10YR 8/2; LOAM; WEAK, COARSE, PLATY STRUCTURE PSEUDO; MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, SOFT, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, MANY, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; 10% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

CK: 82 TO 150 CM; HORIZON DRY; MATRIX MOIST 2.5Y 5/4, MATRIX DRY 2.5Y 6.5/4; LOAM; FEW, FINE, DISTINCT, 5YR 4/6 MOTTLES; WEAK, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; STRUCTURELESS SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; 10% GRAVELLY COARSE FRAGMENTS.

PBI MANITOBA 1984 PROFILE NO. 28

AUG 18, 1986

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	6.7	2.25	0.16				4.8	20.8		15.5	2.6	0.1	0.9
AE	7.3	0.53	0.01				3.1	16.5		11.4	2.5	0.1	0.5
AB	7.2	0.38					3.7	20.0		12.6	4.4	0.1	0.5
BT	7.5	0.40	0.04				3.8	28.6		16.6	7.4	0.1	0.7
CCA	7.8			15.4	9.1	6.0		20.8		23.1	5.7	0.1	0.4
CK	7.8			15.9	6.8	8.4		15.5		20.1	4.1	0.1	0.3

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.4	48.0
AE	0.3	41.9
AB	0.3	44.2
BT	0.3	54.4
CCA	0.4	48.3
CK	0.4	41.9

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	% OF SAMPLE V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY	BULK DENS G/CC
AP					2	6	10	12	12	42		39	19		1.23
AE					2	2	6	10	21	41		39	20		1.33
AB					1	2	7	12	22	44		29	27		1.33
BT			96	83		5	8	15	16	44		23	33		1.34
CCA				94		7	8	13	19	47		32	21		1.38
CK				97	5	7	9	11	12	44		35	21		1.40

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			11.5		23.7								
AE			9.8		22.3								
AB			12.5		22.3								
BT			15.6		22.0	20.0	42.0	17.0		1.8	18.0	76	10
CCA			13.5		21.5								
CK			14.8		21.6	18.0	26.0	23.0		1.8	13.0	40	10

SPECIAL ANALYTICAL DATA

	INFILTRATION (CM)					
HORIZON	5 MIN	10 MIN	15 MIN	60 MIN	INFILTRATION RATE, STEADY STATE (CM/HR)	SATURATED. HYDRAULIC CONDUCTIVITY (CM/HR)
AP	0.8			3.1	1.9	8.7
AE						7.8
AB						7.8
BT						
CCA						
CK						

AUG 18, 1986

HIT MANITOBA 1984 PROFILE NO. 29

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC BLACK. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, EXTREMELY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: HIT, ASSOCIATED SOILS: TGL.

LOCATION: MILITARY GRID REF. 14 UNK 5 7970; NTS MAP AREA 62G ; NE 10 6 12 W.

CLIMATE: 420 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), EXTREMELY CALCAREOUS (>40% CACO3), MORAINAL (TILL), LIMESTONE; LANDFORM CLASSIFICATION: ACTIVE MORAINAL, LOAMY, ERODED(CHANNELLED), HUMMOCKY; SLOPE: 3% COMPLEX SLOPE OF CLASS 3 (2-5%), FACING SOUTHEAST, SITE AT LOWER SLOPE POSITION, SLIGHTLY MOUNDED MICROTOPOGRAPHY, 75 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, MODERATE WATER EROSION, WIND ERODED ; SLIGHTLY STONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: CANOLA STUBBLE. THERE ARE LIMY SPOTS AROUND THE LIMESTONE PEBBLES. CULTIVATING PART OF B HORIZON. SURFACE AND PART OF B HORIZON ARE LESS STONY AND PROBABLY WIND OR WATER MODIFIED. BM HORIZON HAD FEW,THIN,DISCONTINUOUS CLAY FILMS IN LOWER BM

AP: 0 TO 20 CM, RANGE 18 TO 22 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1.5, MATRIX DRY 10YR 3/1.5; LOAM; WEAK TO MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, SOFT, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 10% GRAVELLY COARSE FRAGMENTS; SMOOTH, ABRUPT HORIZON BOUNDARY.

BM: 20 TO 30 CM, RANGE 6 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2, MATRIX DRY 10YR 3.5/3; CLAY LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 10% GRAVELLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

CCA: 30 TO 72 CM, RANGE 29 TO 42 CM; HORIZON DRY; MATRIX MOIST 10YR 6/3, MATRIX DRY 10YR 8/3; GRITTY SILT LOAM; WEAK, MEDIUM, PLATY STRUCTURE PSEUDO; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SOFT, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, MANY, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR AND INTERSTITIAL PORES; STRONG EFFERVESCENCE; EXTREMELY CALCAREOUS; MANY, COARSE, RANDOM, IRREGULAR, HOMOGENEOUS SECONDARY CARBONATES WITH LOOSE , AND LOOSE CONSISTENCE, 10YR 8/2; COBBLY COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY.

CK: 72 TO 84 CM; HORIZON DRY; MATRIX MOIST 2.5Y 5/4, MATRIX DRY 2.5Y 5.5/4; GRITTY LOAM; WEAK, MEDIUM, PLATY STRUCTURE PSEUDO; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SOFT, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, MANY, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; STRONG EFFERVESCENCE; EXTREMELY CALCAREOUS; 10% COBBLY COARSE FRAGMENTS.

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CALCITE (%)	DOLOMITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	7.5	3.56	0.26				3.0	27.6		25.3	5.0	0.1	0.7
BM	7.6	0.84	0.08				2.6	20.8		17.2	4.5	0.1	0.6
CCA	7.7			48.3	29.5	17.4		9.1		19.8	3.1	0.1	0.1
CK	7.8			41.0	12.2	27.3		5.8		16.6	5.2	0.1	0.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.7	53.7
BM	0.5	51.7
CCA	0.5	45.9
CK	0.6	31.7

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP			96	94	6	6	9	11	9	41		34	25	
BM			98	96	2	4	6	10	10	32		40	28	
CCA		98	84	78	4	8	9	12	10	43		29	28	
CK		99	97	89	5	8	12	16	12	53		32	15	

HIT MANITOBA 1984 PROFILE NO. 29

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			12.5										
BM			11.4			17.0	36.0	18.0		1.9	20.0	60	10
CCA			14.2										
CK			8.2			16.0	29.0	25.0		1.9	6.0	60	04

TDP MANITOBA 1984 PROFILE NO. 30

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; VERY LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: REGO HUMIC GLEYSOL. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, AQUIC. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: TDPP, ASSOCIATED SOILS: TDPAND PDA.

LOCATION: MILITARY GRID REF. 14 UMK 2865 8475; NTS MAP AREA 62G *; NW 27 06 9 W.

CLIMATE: 457 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CAREX SPP., SALIX, MINT, CANADA THISTLE, GRASSES.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, WEAKLY CALCAREOUS (1 TO 6% CACO3), ORGANIC, A430; PARENT MATERIAL 2: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), FLUVIOLACUSTRINE; ORGANIC DEPOSIT IS 0.3 M; LANDFORM CLASSIFICATION: LACUSTRINE, HUMIC, LEVEL; SLOPE: 0.5% SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING SOUTH, SITE AT DEPRESSION POSITION, STRONGLY MOUNDED MICROTOPOGRAPHY,50 M LONG; SOIL MOISTURE AND DRAINAGE: AQUIC, POORLY DRAINED, MODERATELY PERVIOUS, VERY SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: NATURAL GRAZING, DITCH DRAINED.

SPECIAL NOTES: OH 2 HAD MANY SNAIL SHELLS PRESENT.

OH: 33 TO 26 CM, RANGE 4 TO 11 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/1; MATERIAL COMPOSITION MODERATE DECOMPOSITION; ORGANIC; WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS SECONDARY STRUCTURE; LOOSE, SOFT, NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM ROOTS; HIGHLY POROUS; WEAKLY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY.

OH1: 26 TO 18 CM, RANGE 3 TO 13 CM; HORIZON MOIST; MATRIX MOIST 5YR 2.5/2, MATRIX DRY ; MATERIAL COMPOSITION HIGH DECOMPOSITION; ORGANIC; WEAK, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; STRUCTURELESS SECONDARY STRUCTURE; LOOSE, NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM ROOTS; HIGHLY POROUS; VERY WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY.

OH2: 18 TO 11 CM, RANGE 0 TO 10 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/3, MATRIX DRY ; MATERIAL COMPOSITION HIGH DECOMPOSITION; ORGANIC; COMMON, FINE, PROMINENT, 5YR 5/6 MOTTLES; STRUCTURELESS STRUCTURE; LOOSE, NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM ROOTS; HIGHLY POROUS; MODERATELY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY.

OH3: 11 TO 0 CM, RANGE 4 TO 14 CM; HORIZON MOIST; MATRIX MOIST 5YR 3/2, MATRIX DRY ; MATERIAL COMPOSITION HIGH DECOMPOSITION; ORGANIC; WEAK, MEDIUM, COLUMNAR STRUCTURE; WEAK, MEDIUM, PLATY SECONDARY STRUCTURE; LOOSE, NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM ROOTS; HIGHLY POROUS; WEAKLY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY.

AH: 0 TO 25 CM, RANGE 14 TO 38 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/0, MATRIX DRY 10YR 4.5/1; SILTY CLAY LOAM; FEW, FINE, PROMINENT, 5YR 5/6 MOTTLES; WEAK, COARSE, PLATY STRUCTURE; STRONG, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, HARD, PLASTIC CONSISTENCE; FEW, FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, VERTICAL, EXPED, CONTINUOUS, SIMPLE, VESICULAR PORES; WEAKLY CALCAREOUS; BROKEN, ABRUPT HORIZON BOUNDARY.

AC: 25 TO 46 CM, RANGE 0 TO 36 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 3/2, MATRIX DRY 2.5Y 6/2; SILTY CLAY LOAM; COMMON, MEDIUM, PROMINENT, 5YR 5/6 MOTTLES; MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, HARD, PLASTIC CONSISTENCE; FEW, FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, VERTICAL, CONTINUOUS, SIMPLE, VESICULAR PORES; STRONGLY CALCAREOUS; BROKEN, ABRUPT HORIZON BOUNDARY.

CKG: 46 TO 106 CM; HORIZON MOIST; MATRIX MOIST 5Y 5.5/2, MATRIX DRY 5Y 7/1.5; SILT LOAM; MANY, COARSE, PROMINENT, 7.5YR 5/6 MOTTLES; STRUCTURELESS STRUCTURE; VERY FRIABLE, PLASTIC CONSISTENCE; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, DISCONTINUOUS, SIMPLE, VESICULAR PORES; COMMON, MEDIUM, SPHERICAL IRON-MANGANESE CONCRETIONS LOCATED LOCAL CONCENTRATIONS (5YR 4/6); MODERATE EFFERVESCENCE.

MODERATE EFFERVESCENCE.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
OH	7.1	24.74	1.73	2.5	0.6	1.7	8.5	72.7		83.7	12.2	1.2	1.0
OH1	7.4	22.54	1.53	1.5	0.3	1.1	7.8	79.8		82.1	14.1	2.7	1.4
OH2	7.5	30.40	2.01	18.3	8.9	8.9	8.8	96.4		156.2	21.7	2.6	0.2
OH3	7.2	48.63	3.22	1.2	0.8	0.4	12.2	170.5		129.2	26.8	3.4	0.7
AH	7.3	3.28	0.30	0.9			4.6	37.6		30.2	7.6	0.8	0.4
AC	7.7	0.62	0.07	4.5		4.2		26.0		21.0	6.7	0.6	0.4
CKG	7.6			22.7	6.2	15.2		13.3		21.9	3.3	0.4	0.2

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
OH		
OH1		
OH2		
OH3		
AH	1.9	81.3
AC	1.5	68.9
CKG	1.2	51.4

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	% OF SAMPLE TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
OH														
OH1														
OH2														
OH3														
AH										5		60	35	
AC										7		63	30	
CKG										7		74	19	

TDP MANITOBA 1984 PROFILE NO. 30

PHYSICAL DATA

HORIZON	SURVEY (CON'T) MOISTURE STATUS (%) 0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ENGINEERING ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
OM													
OH1													
OH2													
OH3													
AH			18.8										
AC			15.2			19.0	46.0	29.0		1.8	15.0	76	10
CKG			12.0			25.0	33.0	28.0		1.6	10.0	40	09

AUG 18, 1986

FRS MANITOBA 1984 PROFILE NO. 31

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: FINE LOAMY, ALKALINE, STRONGLY CALCAREOUS, COOL, PERHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: FRS, ASSOCIATED SOILS: CZK.

LOCATION: MILITARY GRID REF. 14 UNK 2485 7155; NTS MAP AREA 62G *; NW 17 5 9 W.

CLIMATE: 472 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL); LANDFORM CLASSIFICATION: MORAINAL, LOAMY, LEVEL; SLOPE: 1% SIMPLE SLOPE OF CLASS 2 (0.5-2%), FACING NORTHWEST, SITE AT LOWER SLOPE POSITION, LEVEL MICROTOPOGRAPHY,; SOIL MOISTURE AND DRAINAGE: PERHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: E.C.OF CK 2.64, APPEARED WATER-MODIFIED

APK: 0 TO 22 CM, RANGE 18 TO 24 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/1; CLAY LOAM; MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; WEAKLY CALCAREOUS; 10% COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY.

AC: 22 TO 49 CM, RANGE 23 TO 44 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/4, MATRIX DRY ; CLAY LOAM; FEW, FINE, FAINT, 2.5Y 5/5 MOTTLES; MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES: MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; 10% COARSE FRAGMENTS; WAVY, GRADUAL HORIZON BOUNDARY.

CKGJ: 49 TO 150 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 3.5/4, MATRIX DRY ; LOAM; COMMON, COARSE, FAINT, 2.5Y 5/5 MOTTLES; FEW, FINE, DISTINCT, 5YR 4/6 MOTTLES; MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, VERTICAL, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; COMMON, MEDIUM, SPHERICAL GYPSUM CONCRETIONS LOCATED LOCAL CONCENTRATIONS (10YR 6/5); MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; WEAKLY SALINE; 10% COARSE FRAGMENTS.

CHEMICAL DATA (SURVEY)

								C.E.C. (ME/100G)		EXCHANGEABLE CATIONS BUFFERED (ME/100G)			
HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	BUFF.	PERM. CHARG	CA	MG	NA	K
APK	7.5	3.59	0.27	1.5	0.6	0.8	1.6	35.8		35.3	2.9	0.2	1.1
AC	7.8	0.74	0.01	16.4	11.5	4.6		20.1		29.6	1.8	0.2	0.4
CKGJ	7.7			12.2	4.5	7.1		20.4		25.5	1.6	0.5	0.4

FRS MANITOBA 1984 PROFILE NO. 31

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APK	0.9	69.7
AC	1.2	56.1
CKGJ	2.6	54.1

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

	% PASSING										% OF SAMPLE			
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APK					1	3	6	8	9	27		41	32	
AC					1	1	3	5	14	24		45	31	
CKGJ					5	5	6	9	9	34		39	27	

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APK			17.7										
AC			12.7			16.0	38.0	17.0		1.9	17.0	60	10
CKGJ			13.1			19.0	40.0	17.0		1.8	18.0	60	10

AUG 18, 1986

VDL MANITOBA 1984 PROFILE NO. 32

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; DEVIATION(S): TEXTURE; VERY LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: FINE LOAMY/SANDY SKELETAL, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: NOTATION: VDL1, ASSOCIATED SOILS: FIRAND LRY.

LOCATION: MILITARY GRID REF. 14 UNK 740 7325; NTS MAP AREA 62G *; NW 21 05 11 W.

CLIMATE: 450 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MEDIUM ACID TO NEUTRAL (PH 5.6-7.3), GLACIOFLUVIAL, MIXED; PARENT MATERIAL 2: MODERATE CHEMICAL WEATHERING, SKELETAL (>35% OF PARTICLES 2-25 CM), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), GLACIOFLUVIAL, MIXED AND SHALE; LANDFORM CLASSIFICATION: FLUVIAL, LEVEL; SLOPE: 1% SIMPLE SLOPE OF CLASS 2 (0.5-2%), FACING SOUTHEAST, SITE AT MIDDLE POSITION, LEVEL MICROTOPOGRAPHY,150 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, RAPIDLY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: GRAVEL IS STRATIFIED SHALE

AP: 0 TO 18 CM, RANGE 12 TO 24 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; LOAM; MODERATE, COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 10% COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY.

BTJ: 18 TO 30 CM, RANGE 6 TO 16 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 3.5/2; SANDY CLAY LOAM; WEAK, MEDIUM, COLUMNAR STRUCTURE; MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, PLASTIC CONSISTENCE; FEW, FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; 10% COARSE FRAGMENTS; WAVY, GRADUAL HORIZON BOUNDARY.

2BC: 30 TO 42 CM, RANGE 0 TO 19 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 3.5/2, MATRIX DRY 2.5Y 4.5/2; COARSE SANDY LOAM; FEW, MEDIUM, FAINT, 2.5Y 5/4 MOTTLES; WEAK, COARSE, SUBANGULAR BLOCKY STRUCTURE; MODERATE, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; FEW, FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, COMMON, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; COMMON, VERY THIN CLAY FILMS IN MANY VOIDS/CHANNELS AND ON SOME VERTICAL AND HORIZONTAL PED FACES, 2.5Y 3/2; WEAKLY CALCAREOUS; 30% SHALY COARSE FRAGMENTS; BROKEN, GRADUAL HORIZON BOUNDARY.

2CK: 42 TO 125 CM; HORIZON DRY; MATRIX MOIST 2.5Y 3/2, MATRIX DRY 2.5Y 4/3; GRAVELLY LOAMY COARSE SAND; VERY WEAK, COARSE, SUBANGULAR BLOCKY STRUCTURE; STRUCTURELESS SECONDARY STRUCTURE; SOFT, NONPLASTIC CONSISTENCE; STRONGLY CEMENTEDBY LIME, DISCONTINUOUS; HIGHLY POROUS, MANY, FINE, RANDOM, INPED, DISCONTINUOUS, CLOSED, INTERSTITIAL PORES; VERY WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; 60% GRAVELLY AND SHALY COARSE FRAGMENTS.

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CHEMICAL DATA (SURVEY)

HORIZON		PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	I	7.0	4.61	0.35				4.0	28.5		22.4	6.2		0.9
BTJ	I	7.5	1.29	0.13				2.7	27.3		17.3	6.5	0.1	1.1
2BC	I	7.6	1.27	0.11				2.0	22.3		14.7	5.8	0.1	1.4
2CK	I	7.8			13.7	5.8	7.5		13.8		14.5	2.7	0.1	0.7

CHEMICAL DATA (SURVEY)

HORIZON		ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	I	0.4	58.4
BTJ	I	0.6	53.0
2BC	I	0.5	49.3
2CK	I	0.5	34.7

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON		% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP	I					3	13	11	5	11	43		34	23	
BTJ	I					6	28	10	2	3	49		24	27	
2BC	I					10	38	12	2	3	65		18	17	
2CK	I		90	57	38	20	22	34	4	4	84		8	8	

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PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			14.5										
BTJ			18.4			34.0	57.0	24.0		1.6	18.0	75	12
2BC			16.3			36.0	58.0	26.0		1.5	18.0	75	04
2CK												11	07

VDL MANITOBA 1984 PROFILE NO. 33

IDENTIFICATION: SURVEYED BY MNL, FOR THE PURPOSE OF SEMI DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; VERY LIMITED EXTENT; SURVEY REPORT NO. R29.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: FINE LOAMY/SANDY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: VDL, ASSOCIATED SOILS: FIR.

LOCATION: MILITARY GRID REF. 14 UNK 902 7980; NTS MAP AREA 62G *; NE 10 06 11 W.

CLIMATE: 450 METERS ABOVE MEAN SEA LEVEL.

VEGETATION: GRASSES AND FORBES.

SOIL SITE: PARENT MATERIAL 1: CHEMICAL AND PHYSICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), WEAKLY CALCAREOUS (1 TO 6% CACO3), FLUVIOLACUSTRINE; PARENT MATERIAL 2: CHEMICAL AND PHYSICAL WEATHERING, SANDY, MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), FLUVIOLACUSTRINE; LANDFORM CLASSIFICATION: FLUVIAL, GRAVELLY, HUMMOCKY; SLOPE: 12% COMPLEX SLOPE OF CLASS 5 (10-15%), FACING LEVEL, SITE AT CREST POSITION, LEVEL MICROTOPOGRAPHY,85 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, RAPIDLY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: MINES,QUARRIES, ETC.

SPECIAL NOTES: QUARRY. 2CK HAS VERY GRAVELLY AND COARSE SAND LAYERS 8-10 CM THICK. IRON NODULES ARE FOUND IN THE COARSE SAND LAYERS.

AP: 0 TO 10 CM, RANGE 8 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/2; SANDY LOAM; WEAK, COARSE, PLATY STRUCTURE PSEUDO; MODERATE, COARSE, ANGULAR BLOCKY SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; SMOOTH, CLEAR HORIZON BOUNDARY.

BT: 10 TO 35 CM, RANGE 21 TO 39 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3, MATRIX DRY 10YR 4.5/4; LOAM; STRONG, COARSE, COLUMNAR STRUCTURE; STRONG, COARSE, ANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, EXTREMELY HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, MANY, VERY FINE, RANDOM, INPED, CONTINUOUS, SIMPLE, VESICULAR PORES; CONTINUOUS, THIN CLAY FILMS IN ALL VOIDS/CHANNELS AND ON ALL VERTICAL AND HORIZONTAL PED FACES, 10YR 3/3; WAVY, CLEAR HORIZON BOUNDARY.

2CCA: 35 TO 62 CM, RANGE 8 TO 34 CM; HORIZON DRY; MATRIX MOIST 10YR 5/2.5, MATRIX DRY 10YR 5/4; LOAMY COARSE SAND; STRUCTURELESS STRUCTURE; SOFT, NONPLASTIC CONSISTENCE; WEAKLY CEMENTEDBY LIME, DISCONTINUOUS; FEW, VERY FINE, VERTICAL ROOTS; HIGHLY POROUS, COMMON, FINE, VERTICAL, CONTINUOUS, SIMPLE, VESICULAR PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; COMMON, COARSE, VERTICAL, OBLONG, STREAKED AND SPOTTED SECONDARY CARBONATES WITH SOFT CONSISTENCE, 7.5YR 8/1; 60% GRAVELLY COARSE FRAGMENTS; BROKEN, GRADUAL HORIZON BOUNDARY.

2CK: 62 TO 110 CM; HORIZON DRY; MATRIX MOIST 10YR 5/4, MATRIX DRY 10YR 6/4; GRAVELLY SAND; STRUCTURELESS STRUCTURE; LOOSE, NONPLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL ROOTS; HIGHLY POROUS, MANY, FINE, RANDOM, CONTINUOUS, CLOSED, INTERSTITIAL PORES; COMMON, MEDIUM, SPHERICAL IRON-MANGANESE CONCRETIONS LOCATED LOCAL CONCENTRATIONS (2.5YR 4/7); VERY WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; 60% GRAVELLY COARSE FRAGMENTS.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	7.6	1.32	0.01				0.9	14.5		12.0	1.1	0.1	0.4
BT	7.7	0.38	0.01				2.2	18.9		13.2	2.3	0.1	0.3
2CCA	7.8			18.0	10.4	7.0		7.3		16.2	1.5		0.1
2CK	7.8			14.4	5.8	8.2		3.8		8.8	0.7		0.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.7	24.9
BT	0.7	36.9
2CCA	0.4	25.9
2CK	0.4	23.8

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY	BULK DENS G/CC
AP			99	96	10	14	20	19	9	72		17	11		1.61
BT				99	3	7	15	13	9	47		34	19		1.84
2CCA			96	91	10	17	30	18	6	81		8	11		1.89
2CK		99	83	69	6	22	38	20	4	90		6	4		1.72

VDL MANITOBA 1984 PROFILE NO. 33

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING								
	MOISTURE STATUS (%)													
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP			5.8		12.3								
BT			8.0		11.1	14.0	26.0	16.0		1.9	12.0	60	10
2CCA			4.6		10.1								
2CK			4.6		11.2							12	07

SPECIAL ANALYTICAL DATA

	INFILTRATION (CM)					
HORIZON	5 MIN	10 MIN	15 MIN	60 MIN	INFILTRATION RATE, STEADY STATE (CM/HR)	SATURATED. HYDRAULIC CONDUCTIVITY (CM/HR)
AP	1.1			6.8	6.1	15.8
BT						13.0
2CCA						
2CK						32.4

Appendix G

MAP UNIT SYMBOLOGY AND SOIL LEGEND

Soil Legend for R.M. OF LORNE MARCH 1986

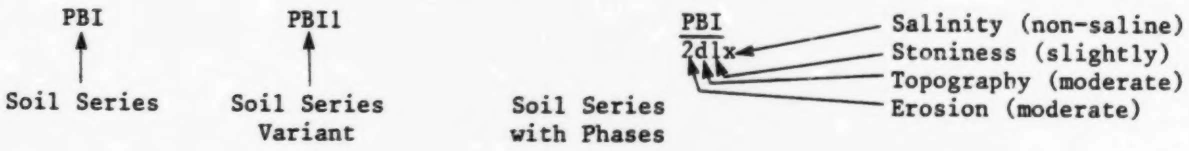
Soil Symbol	Soil Name	Surface Texture	Soil Drainage	Mode of Deposition	Family Particle Size	Subgroup
ATN	Altamont	CL	WELL	Lacustrine/Till	Fine Loamy	O.DG
BWO	Barwood	CL	IMPER	Till	Fine Loamy	GLR.BL
CAV	Carvey	CL	POOR	Lacustrine/Fluvial	Loamy/Sandy Skeletal	R.HG
CKD	Crookdale	CL	IMPER	Lacustrine	Fine Loamy/Sandy	GLR.BL
CXT	Capell	CL	IMPER	Lacustrine/Fluvial	Fine Loamy/Sandy Skeletal	GLR.BL
CXV	Charman	CL	IMPER	Lacustrine	Fine Loamy	GL.BL
CYN	Croyon	L-CL	WELL	Lacustrine/Fluvial	Loamy/Sandy Skeletal	O.BL
CYN1	Croyon	L-CL	WELL	Lacustrine/Fluvial	Loamy/Sandy Skeletal	O.BL
CZK	Cazlake	CL	POOR	Till	Fine Loamy	R.HG
DGF	Darlingford	CL	WELL	Till	Fine Loamy	O.BL
DLN	Danlin	CL	IMPER	Lacustrine	Fine Loamy	GL.DG
DXM	Druxman	L	IMPER	Lacustrine/Fluvial	Loamy/Sandy Skeletal	GL.BL
DZW	Dezwood	L	WELL	Till	Fine Loamy	O.DG
FFR	Fifere	L	WELL	Till	Fine Loamy	O.DG
FIR	Firdale	SICL	WELL	Lacustrine	Fine Loamy	O.DG
FRS	Ferris	CL	IMPER	Till	Fine Loamy	GLR.BL
FSO	Fresno	L	IMPER	Till	Fine Loamy	GL.DG
GRR	Guerra	CL	POOR	Lacustrine/Till	Fine Loamy	R.HG
HIT	Hilton	L	WELL	Till	Fine Loamy	O.BL
HKS	Hickson	L	POOR	Till	Fine Loamy	R.HG
HOS	Horose	CL	POOR	Till	Fine Loamy	R.HG
JYL	Joyale	CL	IMPER	Lacustrine/Till	Fine Loamy	GLR.BL
KIS	Kingsley	L	WELL	Lacustrine/Till	Fine Loamy	D.GL
KUD	Knudson	CL	WELL	Lacustrine/Till	Fine Loamy	O.BL
LEI	Levine	SICL	IMPER	Fluvial	Loamy	GLCU.R
LRY	Leary	LS	WELL	Glaciofluvial	Sandy Skeletal	O.DG
LRY1	Leary	LS	WELL	Glaciofluvial/Lacustrine	Sandy Skeletal/Coarse Loamy	O.DG
MXS	Manitou	CL	WELL	Till	Fine Loamy	O.BL
NKK	Nikkel	CL	IMPER	Till	Fine Loamy	GL.BL
NSH	Narish	CL	POOR	Till	Fine Loamy	R.HG

Soil Legend for R.M. OF LORNE MARCH 1986

Soil Symbol	Soil Name	Surface Texture	Soil Drainage	Mode of Deposition	Family Particle Size	Subgroup
NYO	Nayler	L	WELL	Till	Fine Loamy	D.GL
OIV	Oliver	C	IMPER	Lacustrine	Clayey	GLBL.SZ
PBI	Pembina	CL	WELL	Till	Fine Loamy	D.GL
PBI1	Pembina	CL	WELL	Till/Lacustrine	Fine Loamy/Coarse Loamy	D.GL
PBI2	Pembina	CL	WELL	Till/Glaciofluvial	Fine Loamy/Sandy Skeletal	D.GL
PDA	Prodan	CL	IMPER	Lacustrine	Fine Loamy	GLR.BL
PER	Perillo	Peat	V.POOR	Organic/Lacustrine	Organic/Loamy	T.M
PYR	Poyser	CL	WELL	Till	Fine Loamy	O.GL
PYR1	Poyser	CL	WELL	Till/Lacustrine	Fine Loamy/Coarse Loamy	O.GL
PYR2	Poyser	CL	WELL	Till/Glaciofluvial	Fine Loamy/Sandy Skeletal	O.GL
RAM	Ramada	CL	WELL	Lacustrine	Fine Loamy	O.BL
TDP	Tadpole	CL	POOR	Lacustrine	Fine Loamy	R.HG
TGL	Tiger Hills	L	WELL	Till	Fine Loamy	O.DG
TGL1	Tiger Hills	L	WELL	Till/Lacustrine	Fine Loamy/Coarse Loamy	O.DG
TLI	Tellier	CL	IMPER	Lacustrine/Till	Fine Loamy	GL.DG
TNT	Trinton	L	WELL	Lacustrine/Fluvial	Coarse Loamy/Sandy Skeletal	D.GL
ULH	Ullrich	CL	IMPER	Lacustrine/Till	Fine Loamy	GL.BL
VDL	Vandal	L	WELL	Lacustrine/Fluvial	Coarse Loamy/Sandy Skeletal	O.DG
VDL1	Vandal	L	WELL	Lacustrine/Fluvial	Coarse Loamy/Sandy Skeletal	O.DG
VDL2	Vandal	L	WELL	Lacustrine/Fluvial	Loamy/Sandy	O.DG
VTL	Vartel	L	IMPER	Lacustrine/Fluvial	Loamy/Sandy Skeletal	GL.DG
VTL1	Vartel	L	IMPER	Lacustrine/Fluvial	Loamy/Sandy Skeletal	GL.DG
XVI	Xavier	Peat	V.POOR	Organic	Mesic Peat	TY.M
ZPI	Zaplin	CL	IMPER	Till	Fine Loamy	GL.DG

Appendix G

Simple Map Units (one named soil per delineation)


PBI
Soil Series
PBI1
Soil Series Variant
PBI
2d1x
Soil Series with Phases
Salinity (non-saline)
Stoniness (slightly)
Topography (moderate)
Erosion (moderate)

Compound Map Units (more than one named soil, phase or variant per delineation)

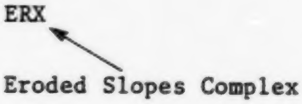
$\frac{\text{TDP}}{\text{oxxs}}^{7}$ - TDPp^{3} ← peaty phase

One soil with
multiple phases
(70% TDP/oxxs
and 30% TDPp)

$\frac{\text{PBI}}{\text{2d1x}}^{4}$ - PBI^{3} - HOSp^{3}

Two soils with multiple phases
(40% PBI/2d1x, 30% PBI/xc1x
and 30% HOSp)

Complex Map Units (undifferentiated complex of soil and landscape features)


ERX
Eroded Slopes Complex

Phases

Degree of Erosion

x non-eroded or minimal
1 slightly eroded
2 moderately eroded
3 severely eroded
o overblown

Slope Class

x	0-2%	level to very gently sloping
c	2-5%	gently sloping
d	5-9%	moderately sloping
e	9-15%	strongly sloping
f	15-30%	steeply sloping
g	30-60%	very steeply sloping
h	over 60%	extremely sloping

Stoniness

x non-stony
1 slightly stony
2 moderately stony
3 very stony
4 exceedingly stony
5 excessively stony

Degree of Salinity

x non-saline
s weakly saline
t moderately saline
u strongly saline

MAPS NOT

FILMED

CARTES

OMISES